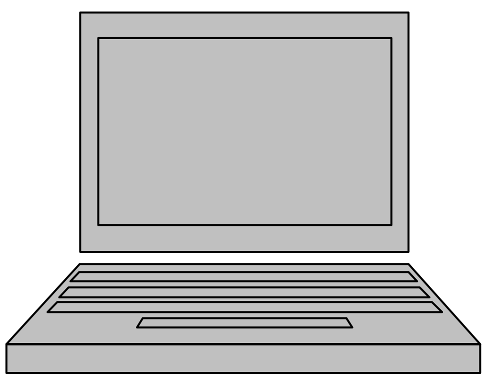
Freedom to Learn

Michigan Students Unplugged

Research Summaries



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Study
A More Complex Picture: Laptop Use and Impact in the Context of Changing Home and School Access, June 2000.

The third in a series of research studies on Microsoft's Anytime Anywhere Learning Program

Author (s)
ROCKMAN *ET AL*
San Francisco,CA

Description/Research Question(s)/Major Finding(s)

During the third year of the Laptop Program, ROCKMAN ET AL continued to examine impacts on teaching and learning within laptop classrooms, and especially the ways in which laptops might be supporting a more constructivist pedagogy. ROCKMAN ET AL was also asked to focus on the possible impact of students' full-time laptop access on standardized test scores.

School selection for the third year of the study was based on the availability of these test scores. Our initial sample of 13 schools at 12 different sites yielded useful and reliable data from eight sites. More than 450 students and almost 50 teachers participated in one or more elements of the research. Our research also included a smaller group of matched students and teachers, in which matched Laptop and Non-Laptop groups came either from the same school (internal matches) or from separate schools with similar demographics and resources (external matches). Our matched sub-sample included over 270 students and 27 teachers.

This report portrays the findings from this group of laptop schools and a smaller group of comparison schools. ROCKMAN ET AL conducted surveys of teachers and students, collected logs of computer use, gathered prompted writing samples, interviewed school administrators, and analyzed standardized test scores from a variety of state- and nationally-normed assessments. This third year report presents a more complex picture of the impact of a fully implemented school Laptop Program.

Findings regarding student use of technology:

1. Access to technology has increased for all.
2. Opportunities for individual access are still greater for Laptop students.
3. Laptop students consistently show deeper and more flexible uses of technology than their Non-Laptop matched groups.

Findings regarding Frequency of school computer use (student report):

1. While Internet access for Laptop and Non-Laptop groups is identical at school and similar at home, Laptop students use the Internet more frequently and for longer periods of time.
2. Laptop students spend more time doing homework on computers than do Non-Laptop students (on average per week).

3. Both Laptop and Non-Laptop students use computers at home for a wider variety of tasks and subjects than they do at school.

Findings regarding impact on teaching:

1. Laptop teachers show significant movement toward constructivist teaching practices.
2. Laptop teachers show significant gains in how often they use computers for specific academic purposes.
3. Laptop teachers' strongest catalysts for change are internal in nature.
4. For both groups, the large majority of teachers who indicated a change toward more constructivist pedagogy also indicated that computers played a role in that change.

Findings regarding impact on learning:

1. Laptop students performed better on our writing assessment.
2. Standardized test score comparisons were inconclusive.
3. Comparison groups of Laptop and Non-Laptop students show less clear differences in some areas than last year.
4. Laptop students rate their confidence in computer skills more highly than Non-Laptop students.

Findings regarding Student and Teacher Beliefs about Technology:

1. Laptop students' attitudes toward computers are more positive than Non-Laptop students'
2. Both Laptop and Non-Laptop students perceived specific benefits from computer use.
3. While both groups are enthusiastic, Laptop teachers rate computers' effects on students more positively than Non-Laptop teachers.
4. All the teachers we surveyed are enthusiastic about the use of technology in the classroom.

URL
For complete report findings: http://rockman.com/projects/laptop/laptop3exec.htm

Keywords:
teaching, learning, writing, frequency of use

Study

A Study of One-to-One Computer Use in Mathematics and Science Instruction at the Secondary Level in Henrico County Public Schools, February, 2005.

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Funded by the National Science Foundation—REC: 0231147----- SRI International
SRI Project P12269

Description/Research Question(s)/Major Finding(s)

In 2001, Henrico County Public Schools (HCPS) in Virginia became the largest school district in the United States to implement one-to-one computing in its middle and high schools. By 2003, 25,000 laptops had been issued for staff and students in grades 6 to 12 to use both in school and home. In January, 2003 SRI International (SRI) and Education Development Center (EDC) began an evaluation of the laptop program

The primary purpose of the study was to collect data about the use of the wireless laptops in selected schools. The study primarily focuses on use in math and science. Research questions investigated by SRI and EDC follow:

1. How, exactly, are laptops used, especially for mathematics and science instruction?
2. What types of teacher professional development support the development of skills to integrate laptops into instruction?
3. What are the academic and organizational support structures and resources that accompany the use of laptops?
4. What factors facilitate the sustained use of these wireless laptops?
5. What are the barriers that make it difficult to use wireless laptops effectively? How are these barriers negotiated or overcome?

Major Findings:

1. One-to-One computing can be implemented on a large scale.

2. Visits from the evaluators combined with surveys revealed that laptops were being used frequently and in a variety of ways. In Science, uses included virtual dissections, virtual field trips, lab write-ups, drill-and-practice statewide tests, databases and spreadsheets, WebQuests, and the creation of Web pages. In Mathematics, students used computer assisted instruction software, sketchpad software, spreadsheets, drawing programs, and sites where teachers create tests that student's access online.
3. From interviews with students, teachers, parents, and administration it was concluded that there was: 1) greater access to resources and information available to students and families, 2) increased student motivation, engagement, interest, and self directed learning, 3) more student interaction with teachers, 4) better-organized students, 5) easier access by teachers and students to up-to-date instructional content, 6) more flexibility for teachers during instruction, 7) increased professional productivity and greater collaboration among teachers, 8) improved home-school communication, 9) an increased need for planning time to make good use of the laptops, and 10) added challenges for teachers to manage classrooms and discipline.
4. Extensive staff development provided by technology trainers in every building was essential for program success.
5. Hardware, software, and technical support, available in each building, was essential for program success.
6. While the program's success was aided by high-level instructional and technical support, barriers included high incidence of breakage and repair, short laptop battery life, students' forgetting to bring laptops to school, management and discipline incidence, and time for teachers to plan and develop lessons.

URL

For complete report findings: http://ubiqcomputing.org/FinalReport.pdf

Keywords:

math, science, middle school, high school, hardware support

Study
Anytime, Anywhere Learning Final Evaluation Report of the Laptop Program, 1999-2000, Walled Lake Consolidated Schools, Michigan

Author (s)
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Robert T. Plants, Research Associate

Description/Research Question(s)/Major Finding(s)
The overall purpose of this evaluation was to determine the effectiveness of providing 5th and 6th grade students with access to laptop computers with regard to classroom learning activities, technology usage, and writing achievement.

The Laptop teachers received ten full days of professional development prior to the 1999-2000 academic year and six one-half day sessions during the year. The training was based on the NTeQ model which provides teachers a framework to develop problem-based lessons that utilize real-world resources, student collaboration, and the use of computer tools to reach solutions.

The evaluation period extended from September 1, 1999 through May 30, 2000. The evaluation design was based on both quantitative and qualitative data collected from students, teachers, and parents involved with the Laptop Program and students and teachers in non-Laptop classrooms in seven schools (four elementary and three middle) within WLCS. Comparative analyses were completed for teaching activities and learning outcomes and descriptive analyses were completed for student, teacher, and parent reactions to the Laptop Program.

The data set for the evaluation included classroom observations, student writing test scores, student surveys and focus groups, teacher surveys and interviews, and parent surveys and interviews.

Research Questions/Results:

1. Is teaching different in laptop classrooms?
    - According to both teacher reports and classroom observations, Laptop classes are being taught differently than regular (Control) classes. Not only did the former classes incorporate technology to a much greater degree, they tended to employ more student-centered strategies such as project-based learning, independent inquiry/research, teacher as coach/facilitator, and cooperative learning. Most revealing in the study were the ways in which technology was accessed and employed in the Laptop classrooms. Compared to their Control counterparts, the Laptop students demonstrated more technical skill with computers and used computers more extensively for a variety of production and research functions. Not surprisingly, observers rated Laptop classes as making much more *meaningful* usage of computers as educational tools.
    - Nearly all teachers believed that they were teaching differently than before by integrating technology into both newly developed lessons and existing lessons

that had previously been taught without computers. Further, nearly all felt that they had increased the frequency of project-based learning, higher-order learning activity, and school-related interactions with parents and students. Laptop parents reported that their child was taking advantage of the laptop computer for school and other activities, especially in developing research skills.

- The implication from these multiple data sources is that teaching and learning were being impacted, in ways that promoted active learning and technology applications, as a consequence of all students having continual access to individual computers. Not surprisingly, although cooperative learning was observed relatively frequently in Laptop classes, students typically worked individually while using computers. Thus, they benefited from having their own computer to complete their work, while still being able to collaborate easily with others on information and strategies.

2. Do students behave differently in laptop classrooms?
   - Laptop students were more active, autonomous, and collaborative in their classroom behaviors. For example, cooperative learning was observed "frequently" or "extensively" in 35% of the Laptop classes, but only 11% of the Control classes. Students frequently or extensively engaged in projects in 55% of the Laptop classes compared to only 17% of the Control classes. Laptop teachers confirmed these impressions by describing their students as more independent, active, and engaged. The teachers were highly impressed with students' abilities and interests in using computers to enhance learning.
   - In their survey and interview responses, students indicated they had increased their computer skills substantially and were much more prepared to do Internet research. About two thirds of the students generally worked with the laptop alone in the classroom, but they still collaborated frequently with others in sharing information, asking questions, and providing assistance. As a group, the students were less committal about the effects of the laptop in increasing the interest in learning, writing skills, and facilitating collaboration, although about one-third (still a substantial number) felt that they did realize these types of benefits.

3. Do students achieve differently in laptop classrooms?
   - In this study, we assessed student achievement in terms of writing performance on a prompted essay. Grading, using a four-point rubric, was "blind" to students' enrollment in Laptop vs. Control classes. Results significantly favored the Laptop group on all evaluation dimensions -- Organization, Ideas, Style, and Conventions. Aside from being statistically significant, the differences across all dimensions reflected relatively strong advantages for the Laptop group, with effect sizes ranging from +0.61 to +0.78.

URL
For complete report findings: http://walledlake.k12.mi.us/aal/evaluation.pdf

Keywords: writing, instruction, engagement, parent/student/teacher impressions

Study
Anytime, Anywhere Learning Final Evaluation Report of the Laptop Program, Year 2, 2000-2001, Walled Lake Consolidated Schools, Michigan

Author (s)
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Description/Research Question(s)/Major Finding(s)
This report summarizes the results of an evaluation study of the Year 2 implementation of Anytime, Anywhere Learning (Laptop Program) in Walled Lake Consolidated Schools (WLCS). As in the Year 1 evaluation (Ross, Morrison, Lowther, & Plants, 2000), the overall purpose of this study was to determine the educational impact of providing 5th, 6th, and 7th grade students with access to laptop computers with regard to classroom learning activities, technology usage, and writing achievement.

The Year 2 evaluation period extended from September 1, 2000 through May 30, 2001. The evaluation design was based on both quantitative and qualitative data collected in eight schools (four elementary and four middle) within WLCS. The evaluation involved 40 classrooms distributed across three grade levels: 8 fifth grade, 15 sixth grade, and 16 seventh grade. Participants included students, teachers, and parents involved in Laptop classrooms (with one laptop computer per student) and in Computer-Extended classrooms (with 1 to 5+ computers available for student use).

The Year 1 study compared laptop classrooms with teachers who attended technology integration training to non-laptop classrooms with teachers who did not attend training. The Year 2 study compared laptop classrooms with teachers who attended technology integration training to "Computer-Extended" classrooms (that had 1-5 computers) with teachers who also attended technology integration training.

Comparative analyses were completed for teaching activities and learning outcomes, and descriptive analyses were completed for student, teacher, and parent reactions to both the Laptop Program and Computer-Extended classes. The data set for the evaluation included classroom observations, student achievement writing and problem-solving test scores, student surveys and focus groups, teacher surveys and interviews, and parent surveys.

The WLCS's *Writing Scoring Guide* was used to assess prompted writing samples from Laptop and CE students. To assess the ability of students to comprehend problems and formulate solutions, a problem-solving task was devised for this study. Students were given a problem situation, and were instructed to describe how they would solve the problem, what materials and resources they would use, and whether (and how) they would work with others. Components consisted of "Understands problem," "Identifies what is known about the problem," "Identifies

what needs to be known to solve the problem," "Determines how the data need to be manipulated to solve the problem," "Describes use of technology," "Describes how to present findings," and "Collaborative learning."

The student, teacher, and parent surveys, interviews, and focus groups primarily focused on three areas: (1) to what extent the computers had a personal impact (increased skills – research, computer, learning), (2) to what extent the computers impacted what happens in the classroom, and (3) the benefits, difficulties, and ways to improve the program.

Research Questions/Results:

1. Is teaching different in laptop classrooms?
   - In contrast to the Year 1 evaluation, the present study revealed relatively few differences in teaching methods between Laptop and CE classes. Objectively, the most obvious explanation of the discrepancies is that the present sample of Laptop classes tended to use student-centered teaching approaches less frequently than did the Year 1 group. While the present (Year 2) Laptop classes were certainly busy and active places compared to typical classrooms that we have observed (Ross, Smith, Alberg, & Lowther, 2000) perhaps the teachers were less influenced by a "Hawthorne-type" effect than in Year 1, and thus were less likely to demonstrate "model" lessons. Some may have felt more confident about intermixing traditional practices to ensure that state content standards were being addressed. CE classrooms, however, were generally comparable to the Control classrooms of the first year.
   - Consistent across both years of the study was the Laptop students' more frequent usage of the computer as a learning tool. Specifically, such applications were observed in 66% of the visits to Laptop classes compared to only 17% of the CE classes, a highly significant difference.

2. Do students behave differently in laptop classrooms?
   - The Laptop and CE students behaved fairly comparably, except that Laptop students tended to use computers more frequently, extensively, and independently.

3. Do students achieve differently in laptop classrooms?
   - In the present study, the writing assessment included both the 6th and 7th grades. Results showed substantial advantages for Laptop over CE students. Six of the eight effect sizes (4 components x 2 grades) exceeded +.80, while the mean differences in many cases approximated or exceeded a full rubric point. Clearly, the Laptop students were demonstrating superior writing skills.
   - The Laptop program's positive impact on problem-solving may have been influenced by students' engagement in research activities, as evidenced in teacher and student survey responses. Student Survey responses revealed greater confidence by Laptop and CE students in using basic software applications. Engagement in research activities was often perceived as one of the best aspects of the Laptop program.
   - Conceivably, engaging in more problem-solving activities and having greater access to application software for solving problems increased Laptop students' range for planning and conceptualizing how a new, complex problem could be approached and systematically solved.

In the Year 2 evaluation of the Laptop Program, the results are supportive of beneficial impacts of the Laptop program on students, teachers, and parents. As in the Year 1 study, all three groups believed that the program was positively changing teaching and learning both at school and at home. Although the results were less striking this year, the reasons seem largely due to (a) CE teachers being more oriented and trained to use computers than were the Year 1 "control" teachers, and (b) the scale-up of the Laptop program to more teachers and classes. Still, there was no question that the Laptop students were far superior to CE students in their computers skills and usage of technology for learning.

Even though pre-formed groups were used in the present study, the positive results from the writing and problem-solving assessments are nonetheless highly suggestive. Laptop students were doing more sustained writing in class and were demonstrating more skill in writing, making a causal connection highly likely. It is obvious that continual and immediate access to computers provides the Laptop students and their teachers with a very strong advantage. Similarly, Laptop students had greater opportunity to engage in open-ended learning tasks that emphasized problem solving, and to use a variety of software tools to increase the speed and depth of their work.

We should note a possible concern that acquired greater saliency in this year's results. First, it is noteworthy that having to carry the computer to and from school was viewed by both Laptop students and their parents as the most significant negative aspect of the program. Yet, students and parents reported only a moderate amount of school-related computer use at home. Equipment problems (with extended waits for repair) seemed to be exacerbated by all of the transporting of computers. Second, there was noticeably increased dissatisfaction by students and parents with the exclusionary nature of the program. Those not selected for financial or other reasons would miss out on the benefits of technology-immersed classroom learning. Perhaps the finding of greatest importance from the past two years is that full access to computers in the classroom, whether or not there is access at home, is what drives curriculum and learning most substantively.

URL
For complete report findings: http://walledlake.k12.mi.us/AAL/Eval_Year_2.pdf

Keywords:
writing, problem-solving, engagement, instruction, parent/student/teacher impressions

Study
Anytime, Anywhere Learning Final Evaluation Report of the Laptop Program, Year 3, 2002-2003

Author (s)
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Description/Research Question(s)/Major Finding(s)
The purpose of the Year 3 study was to determine the effectiveness of providing 5th grade students with access to laptop computers and if differences occur based on the amount of time (24 hours per day vs. classtime only) and/or type of access (personal laptop vs. laptop on school mobile cart) to the computers.

The Year 3 evaluation of the laptop program was structured around six primary research questions that focused on classroom practices, student achievement, and student behaviors and attitudes. Also of interest was the reaction and support of teachers involved with the laptop program or those who used mobile laptop carts (cart).

Research Questions:

1. What differences emerge in teaching strategies used during a computer-supported lesson in laptop versus cart classrooms?
   - Year 3 results revealed no significant differences between teaching activities or computer use in the laptop vs. cart classes. The classroom observations revealed that both laptop and cart teachers acted as coach/facilitators, engaged students in sustained writing and the use of computers as a learning tool or resource. Though not significant, the laptop students were engaged in more independent inquiry research as compared to the cart students and were more frequently in classes with a high level of academically focused class time.
   - When examining student use of computers, the Year 3 data again revealed no significant differences between the laptop and cart classes. Both groups of students primarily worked alone on up-to-date, Internet-connected computers, however the computer skills of the laptop students were somewhat higher than the cart students. Word processing was the most frequently used software by both groups and language arts was most frequently the subject area of the computer activities. Regarding the meaningfulness of the computer activities, most were considered to be somewhat meaningful, with the laptop students more frequently engaging in more meaningful activities than the cart students.

2. Do laptop students differ from cart students in their writing skills?
   - The Year 1 and 2 studies revealed that the laptop students demonstrated superior writing skills as compared to the control students. The results from the Year 3 study followed the same trend, with laptop students showing significant advantages over cart students on the four dimensions of Ideas and Content, Organization, Style, and Conventions.

- Although the observation data did not reveal significant differences in classroom practices, laptop students more frequently used word processing and the Internet for language arts activities and independent inquiry/research. In addition, a majority of the laptop students felt the computers had increased their interest in learning, made learning more fun, and increased their overall computer skills. Perhaps the above factors, along with 24-hour access to the laptops, contributed to overall writing ability of the laptop students.

3. Do laptop students differ from cart students in their approach to problem solving?
   - The Year 3 results showed the laptop students outperforming the control students on five of the seven problem-solving components.
   - Even though significant differences in classroom practices were not revealed, laptop students more frequently engaged in independent inquiry/research and more frequently used the Internet – both of which could perhaps enhance student's problem-solving performance (e.g., understanding a problem, identifying what is needed to solve the problem, how to use technology to solve the problem) . The laptop students reported significantly more use of the laptop computers in mathematics and social studies – subject areas into which teachers might more easily integrate problem-based learning activities. They also indicated that they frequently engage in cooperative learning, which requires students to process and share information. These combined factors conceivably contributed to the laptop students' increased problem-solving ability, however further research with other students is needed.

4. Do laptop students differ from cart students in their mathematics, science, and social studies achievement at the 5th grade level?
   - The analysis of achievement scores in mathematics (1-4), science and social studies revealed directionally higher means for laptop students as compared to the cart students. However, significant differences between the two groups only occurred on one measure, the Mathematics Benchmark 2 (Geometry and Measurement). This difference did have an *ES* = +.44, indicating a moderate effect favoring the laptop group. Since use of the 4th grade MEAP scores as a covariate addressed the initial laptop student advantage, the difference is less likely to be attributed to the laptop students just being "better" students.

5. How do students perceive the use and access of laptop computers?
   - Both the laptop and cart students responded positively when asked about the benefits of using laptop computers for school-related activities. Both groups also indicated that they experienced very few difficulties or barriers to using the laptops in a classroom setting. However, significant differences emerged between the laptop students, who "own" the laptop and have continuous access to it and the cart students who use a school laptop from a mobile cart. For example, the laptop students were significantly more positive that using the laptop had increased their computer skills, made learning more fun and interesting, and provided incentives to get better grades. Personal ownership also seemed to influence the type of laptop usage that occurred during class time as the laptop students were much more likely to use their computers alone every day and to work in pairs several times a week. The subject areas of computer activities were also significantly different in laptop vs. cart classes. The laptop students responded that they used laptops for language arts almost every day and were more likely than cart students to use them

for mathematics and social studies, however to a lesser degree than for language arts. No significant differences between the groups emerged for science. These results suggest student attitudes about the educational benefits of using laptops are positively influenced when they "own" a laptop as compared to using school computers stored on a mobile cart.

6. What do teachers perceive as the benefits and problems of integrating technology in laptop vs. cart classrooms?
   - Although only a small number of teacher surveys were completed (laptop = 9; cart = 3), the data yielded information that can be suggestive of trends in teachers thoughts regarding the benefits of students using laptops as a learning tool. As with the student survey responses, both the laptop and cart teachers were generally positive about the laptops and unanimously agreed that use of laptops had increased students' interest in learning. However, the laptop teachers had greater agreement than cart teachers that the laptops helped to increase student writing and research skills, their overall performance and grades, and the ability to work with other students.

In conclusion, even though the classroom environments and practices in laptop and cart classrooms are very similar, the laptop students emerge with more confidence in the educational benefits of using computers and with better writing and problem-solving skills. Thus the continuous access and added responsibility of having personal computers results in students being better prepared to meet the challenges offered in today's highly technical society. However, the feasibility of providing every student with a laptop is financially unrealistic. Therefore, if laptop carts were made more readily available to K-12 teachers trained in the NTeQ approach, perhaps cart students could achieve benefits similar to the laptop students. Although, these results are promising, it is clear that further research that investigates student access to and educational use of laptops is needed.

URL
For complete report findings: http://walledlake.k12.mi.us/AAL/Laptop_Report_Yr3.pdf

Keywords:
5^{th} grade, 1:1 vs shared, writing, problem solving, math achievement

Study
Apple Classrooms of Tomorrow (ACOT) Evaluation Study – First and Second Year Findings

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Description/Research Question(s)/Major Finding(s)
In 1987, a year after ACOT provided teachers and students in five public school sites with personal computers for school and home use, UCLA Center for Technology Assessment initiated a long-term examination of the impact of ACOT's innovative program on students, staff, and parents. The goal was to develop a model of technology assessment appropriate for evaluation of educational uses of computers and other technologies.

Over the two-year period, the team applied a variety of traditional and innovative measures to document changes in ACOT participants' achievement, attitudes, and daily practices.

Results showed that ACOT students maintained their performance levels on standard measures of educational achievement in basic skills, and they sustained positive attitudes as judged by measures addressing the traditional activities of schooling.

Informal observation suggests the experience of ACOT itself appears to be resulting in significant new learning experiences for students and greater attention to complex, higher level processing.

Analyses of 1988–89 data indicated that ACOT had considerable personal and professional impact on its teachers. Some teachers appeared to be constructing new interpretations of their own and their students' abilities and of students' roles in their own learning. Some had developed higher expectations for their students, and most teachers were quite satisfied with their students' academic and socio-emotional progress, though some expressed concerns about covering the standard curriculum. Many teachers noted the value of computers in their teaching and the positive impact on their job interest and performance. Many reported improved teacher-student roles and positive feelings of self-worth. Although most teachers experienced personal stress, they reported the challenge and growth to be more significant.

ACOT parents generally felt the project had benefited their children in their knowledge of computers, attitudes toward learning, and achievement, though they had some concerns about curriculum coverage. Home use varied considerably across site and grade, providing provocative data on possible relationships between computer use and socioeconomic level (e.g., computers are a novelty in lower SES homes) and grade (e.g., homework demands upon secondary students limit access for other family members).The computers appeared to be increasingly integrated in home activities, most children using them for homework, games, personal writing, practicing, and graphics.

URL
For complete research report: http://164.83.2.51/ACOT%20reports/rpt07.pdf

Keywords:
Student achievement, parents, student attitudes, teacher attitudes

Study
Assessing the Impact of One to One Technology Immersion on Student Attendance: Chasing Shadows or the Panacea for Educational Reform? December, 2004

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Description/Research Question(s)/Major Finding(s)
Since the initial introduction of personal computers into K-12 classrooms in the early 1980s, proponents of educational technology have heralded the potential for computer technology to transform instructional environments and improve student achievement. Advocates for these costly immersion projects have forecasted improved levels of student achievement, higher attendance rates, lower dropout rates, improved levels of student motivation to learn during and after the traditional school day, improved communication with parents, and acquisition of needed twenty-first century digital literacy skills as expected outcomes of these projects.

This study attempted to determine, with a limited data set, if rates of student attendance are higher within a technologically immersed school environment as predicted by advocates of these immersion projects. Student attendance rates at one of the twenty-two immersion campuses participating in the 2004-2006 statewide Technology Immersion Pilot (TIP) project in Texas were gathered, aggregated, and analyzed.

As expected by this researcher but not predicted by the prevalent cultural faith in instructional technology to bring about positive instructional change in the classroom, the immersion of the Floydada JHS student body and teaching faculty in fall 2004 did not significantly impact rates of student attendance. This result is not surprising, especially given the fact that the TIP project is only in its first semester, and only the first 34 days of student immersion with laptop computers were analyzed in this formative research study.

It is not clear why student average daily attendance (ADA) went down rather than remained constant or increased during the study period. It is possible that as the academic term progressed, more frequent extra-curricular activities required greater numbers of students to be absent from school. It is also possible that as harvest time for crops grown in the Floydada area approached later in the term, larger numbers of students were needed to assist family members with extra farm duties. Illnesses caused by seasonal allergies as well as influenza are also possible explanations for higher levels of student absenteeism / lower levels of student attendance later in the fall 2004 academic term. Absences surrounding the Thanksgiving holidays occurring in the latter part of the study period may also account for lower levels of student attendance.

Despite policymaker and administrator professed desires to the contrary, it seems most likely that the individual teacher in the classroom makes the biggest difference and impact on student learning, rather than the technology that is present or absent from the environment.

URL
For complete report findings: http://www.wesfryer.com/onetoone/onetoone_attendance.pdf

Keywords:
Attendance

Study
Barriers to Teachers' Adoption and Use of Technology-Supported Learner-Centered Pedagogies, 2002-2003

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Description/Research Question(s)/Major Finding(s)
Problem-based learning (PBL), a teaching/learning approach that relies on ill-structured problems to provide opportunities for student learning, can involve technology as a tool for acquiring, manipulating, and communicating information. In this report, we outline the professional development activities we have used over the last three years to support teachers' implementation of problem-based learning in their classrooms. Based on teacher interviews and PBL implementation data, we describe strategies that have worked, as well as those that haven't, and outline steps taken to confront the various barriers teachers encounter as they attempt to incorporate learner-centered pedagogies, supported by technology, within traditional classroom practice.

Tech-Know-Build: Indiana Students Building Knowledge with Technology is a Technology Innovation Challenge Grant project, funded by the U.S. Department of Education, which "combines two powerful trends in educational reform: the infusion of laptop and wireless Internet technology to support learning, and the adoption of problem-centered, inquiry-based pedagogy to enhance teaching.

Based on the overarching goal of the grant -- to help teachers facilitate technology-supported, learner-centered pedagogies within their classrooms -- we have introduced teachers to a problem-based learning pedagogy through either a semester-long professional development course (year one) or a 2-week intensive summer institute (years 2 and 3). The intensive professional development experience provides teachers with the opportunity to explore the use of both laptop technologies and learner-centered pedagogies, as well as time to collaborate with other teachers from their buildings to create a problem-based unit that uses technology as a tool for understanding. We believe that problem-based learning (PBL) offers a promising approach because it emphasizes student investigations of complex problems in authentic contexts (Delisle, 1997; Levin, 2001). Additionally, technology readily plays a supportive role as a tool for gathering information, analyzing and representing data, and communicating results.

The first year
To prepare teachers to utilize this learner-centered pedagogy we utilize an approach that involves modeling PBL via a realistic activity involving in-service teachers, pre-service teachers, and K-12 students. The modeling activity is used to help teachers understand the problem-based learning process, the roles of teachers and students, and the use of technology as a supporting

tool. After participating in this modeling activity, teachers work in teams to create their own PBL units, to be implemented during the semester/year following their involvement in the semester course or summer institute. The components of these units include a driving question, curricular objectives and links to curricular standards, possible student investigations and other activities, materials and resources, and assessment tools. Despite these efforts, however, the number of teachers currently implementing PBL units in their classrooms is extremely small.

The second year, the training was modified to provide:

- more information about PBL
- more examples of teachers using technology in meaningful ways
- information about assessment techniques (rubrics, checklists, etc.)
- a modeling activity focused on a broader social issue

Again, implementation of the PBL units was fairly limited.

The third year changes based on the results from year 1 and 2:

- return to the water quality problem for the modeling activity
- more detailed information about the concept of PBL
- examples of teachers using technology within a PBL context
- explicit discussions about PBL implementation and evaluation issues

In order to avoid experiencing the same disappointments as those experienced in previous years, we have implemented several support strategies to assist teachers as they begin implementing their units. For example, a dinner seminar was hosted mid-way through the semester as one way to keep teachers' enthusiasm at a high level.

This project highlights the amounts and kinds of support teachers need as they attempt to incorporate more learner-centered approaches within their classrooms. As suggested by our ongoing results, formal professional development is not likely to have lasting effects unless it can provide continuity between what teachers learn and what goes on in the classroom. Professional development efforts must address teachers' changing needs in both powerful and flexible ways.

URL

For complete report findings: http://www.edci.purdue.edu/ertmer/docs/SITEO3_TKB_paper.pdf

Keywords:
teacher staff development, PBL, middle school

Study
Challenges in Implementing Technology-rich Curricular High School Biology Materials: First Year Findings from the *Exploring Life* Project, 2002

Author (s)
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Ward M. Cates and Alec M. Bodzin, Lehigh University

Description/Research Question(s)/Major Finding(s)
Eighteen high school biology teachers from a stratified sample of thirteen distinct geographical United States regions participated in evaluation of the first-year prototypes of *Biology: Exploring Life*, a biology program that includes a textbook with an accompanying Internet component and wet-lab investigations. Web activities explain and reinforce the text and promote active, hands-on learning.

Questions:

1. How ready are biology teachers who are early adopters of technology to employ a curriculum that requires students to use computers on a regular or even daily basis?
2. What motivation, additional education, hardware, or skills do teachers require in order to integrate almost-daily computer use into the curriculum?
3. Do high schools have the adequate technology facilities to implement a curricular program that incorporates students using computers on an almost-daily basis?
4. How might existing schools change to support a technology-based curricular program?

The Milken Foundation funded a study to identify and list the factors that determine whether schools will be successful in bringing up the level of student use of computers for learning (Lemke & Coughlin, 1998). Missing from their list of keys to success, however, was a well-developed, comprehensive curriculum that can be used for an entire course of study. Such year-long curricula that integrate technology may be crucial to helping teachers bring about the kind of systemic change that technology may demand.

To address just this need, the present project integrated technology into the full-year curriculum. The product, whose prototyping was funded by the National Science Foundation, integrates a shorter (800-page), concept-oriented textbook, a collection of inquiry-based lab and field activities, and an extensive World Wide Web site that provides an interactive learning environment for students. These components are designed to work together to help teachers provide a more interactive classroom in which computers support and enhance delivery of the curriculum. Unlike textbooks "published" (posted) on the Web largely as Acrobat PDF files or other forms of documents and worksheets, *Biology: Exploring Life* materials go beyond simple reading, teacher lesson plans, and activity worksheets. Web activities explain and reinforce the text and promote active, hands-on learning. They encourage students to explore, analyze, draw conclusions, and share their findings.

Forty-two high school biology teachers, one preservice biology teacher, and one science supervisor were selected from a stratified sample of thirteen distinct geographical regions that

included Alaska and Hawaii. In addition, five classrooms were chosen for field observations based on arbitrary volunteer selection.

Despite teachers' prediction of reduced planning time requirements, once the field test was underway, the majority of teachers reported that they spent additional time planning and preparing to teach. Most of that extra time was spent dealing with the technical requirements: arranging computers, adjusting schedules around labs times, and installing software and Web browser plug-ins. Many teachers reported spending planning time developing supplemental worksheets to be used as an accountability measure when students completed online tutorials. As anticipated, teachers did feel that the program reduced the amount of time they spent searching for support materials, and respondents suggested that they would be able to spend less time planning if their school computers were properly configured and the publisher developed worksheets to be used with materials.

Our observations indicated that wireless computers offered greater flexibility in classroom arrangements than using a computer lab, permitting more collaboration and small group work. However, even with wireless computers, difficulties occurred. In one classroom, students had to walk around the room, holding their computers like divining rods to find the service area of their wireless computer hub. Their room was, by the pernicious nature of the technology gods, located in an area that received three separate signals from disparate ends of the school.

Regardless of how much technical support teachers had in their school, all teachers became emergency technicians while pilot testing the prototype materials, troubleshooting problems as necessary during class. Many teachers had to learn to download software, reboot computers, and set up audio capabilities on their computers. The amount of time and type of problem was usually a minor annoyance. However, for almost 43% of our pilot teachers (18 teachers out of the 42) it constituted enough of a hardship that pilot testing was aborted.

Most teachers did not implement all computer-based activities in a chapter. When teachers had limited time, wet labs were the first activities to be omitted and teachers tended to use the Webquests at the beginning of the chapters as an introduction to the chapter's content. Interactive tutorials were next most likely to be used by teachers to illustrate concepts or to reinforce vocabulary.

Several students noted in their journals that their learning became more intrinsic and relied less on the teacher's direct instruction. Many students said they enjoyed the shift in emphasis to a more student-centered atmosphere. However, not all students preferred learning autonomously with computers. In two schools, higher level biology students reported that they preferred a more traditional textbook-centered curriculum over the prototype materials.

For instance, one teacher noted that the academic performance of her students with Individual Education Plans (IEPs) for learning disabilities improved while implementing the program. The most dramatic observation was a student whose average mark improved from a D to a B.
In an unfortunate confirmation of the learner's preference for the prototype approach, the student's mark slipped back to a D when the textbook-centered curriculum was reinstated at the

end of the pilot test. In the same class, two English-as-a-second-language students' marks also improved while using the prototype materials.

In contrast, analysis of student journals indicated that low-proficiency readers had more difficulty reading text on a computer monitor than from a textbook. These learners also became disorientated with activities that launched more than one browser window. For instance, some of the Webquests required learners to navigate across Websites, opening several concurrent windows. As a result, such students appeared to have trouble staying focused and on task, jumping instead between and among Websites.

URL
For complete report findings: http://www.usingexploringlife.com/downloads/necc2002.pdf

Keywords:
high school, biology, curriculum

Study
Computer-Based Solutions for Secondary Students with Learning Disabilities: Emerging Issues

Author (s)
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Description/Research Question(s)/Major Finding(s)
Secondary students with learning disabilities often find the challenges of an academic curriculum more than they can handle. Faced with a text-centered world, they are frequently encumbered by an inability to read and write with sufficient fluency and legibility to meet the expectations of their teachers. Faced with a fast-paced curriculum, they are frequently hampered by minimal organizational skills and slowed by the additional time that even simple assignments can demand when the student has a learning disability. Faced with low self-confidence and a history of poor achievement, they frequently choose (or are advised to take) courses with minimal intellectual content and limited utility as preparation for postsecondary education. Faced with academic frustration and the constant threat of failure, they frequently drop out of high school before completing the requirements for graduation.

At the Center for Electronic Studying my colleagues and I have been investigating ways in which computers and other forms of advanced technology can be used to support students' efforts to succeed in school. Specifically, we have explored ways in which computer technology can be used to minimize the negative impact of students' disabilities and maximize the potential of their learning strengths. We describe our approach of supporting students through the use of computer technology as electronic studying, that is, use of the computer to enhance students' abilities to read, write, and think in ways that promote learning and success in school. By focusing on the processes of learning (rather than on the learning of specific content), we have worked to uncover strategies for using the computer as a study tool that have relevance to almost all content areas.

In total, we have explored computer-based solutions for three types of academic problems: reading difficulties, writing (as well as spelling) difficulties, and learning difficulties. Two examples of strategies designed to address the reading difficulties of students include a three-step process for textbook notetaking (Anderson-Inman, 1995) and the use of embedded resources or "supported text" in hypermedia versions of students' content-area reading materials (Anderson-Inman & Horney, 1997). With respect to students' writing difficulties, we have explored strategies for using computer-based writing aids and organizing ideas with electronic outliners and concept mappers, as well as taking notes from lectures and discussions (Knox-Quinn & Anderson-Inman, 1996). To address the learning difficulties of students, we have found effective ways to help them use computer technology to organize and manage their time, manipulate information in search of patterns and meaning, and study for tests (Anderson-Inman et al., 1996).

One of the keys is sufficient access, and sufficient access means as close to constant access as possible. Not only does this provide students with computing power at critical times (e.g., to take legible notes in class), it also creates an environment in which students can personalize the hardware and software for their unique learning needs. For example, screenshots of the computer

desktop and file organization styles adopted by students in one of our projects revealed vastly different approaches to organizing and storing information. These differences presumably reflect personal preferences, perhaps influenced by course expectations and instructor style. Shared computers, even shared laptop computers, would not permit this level of customization. When used in the way I describe, portable computers are analogous to other types of assistive technology. In the words of one of our students, the computer is a "wheelchair for the mind." Just as we would never expect 5-10 students with orthopedic impairments to share a single wheelchair, we should not expect 5-10 students with learning disabilities to share a single computer.

In our investigations, successful implementation of computer supported studying often has revolved around finding a personally meaningful solution to a student's difficulties in school. For example, one of our students was faced with writing a paper that required synthesizing information from multiple sources. She felt overwhelmed by the task. Learning a computer-based strategy for synthesizing information (Anderson-Inman & Zeitz, 1994) resulted in both an A on the paper and her conversion to computer-supported studying as a way to get through school. For this type of motivational transformation to occur, the student must believe that there is a problem that needs to be solved and that the proposed computer-based solution is effective.

Students in our projects have been found eligible for special education services using standard statewide procedures for diagnosing learning disabilities. This particular diagnosis, however, hinges on the assumption that students with learning disabilities fail to achieve in school commensurate with their aptitude, as indicated by IQ tests. In other words, for students to be diagnosed with learning disabilities, there must be a significant discrepancy between achievement and aptitude, and this discrepancy must not be explainable by other factors. Computer-based solutions for students with learning disabilities, however, minimize and sometimes even eliminate this discrepancy. With sufficient access to supportive technology, and sufficient instruction on how to use it for the purposes of studying and learning across the curriculum, students with learning disabilities can achieve up to normal expectations. If they are now successful in school (and in some cases our students were identified by teachers as the best students in class), do they still have learning disabilities?

Computers and other forms of advanced technology hold great promise, especially when combined with systematic efforts to identify and teach strategies for computer-based learning and studying.

URL

For complete report findings:
http://www.ldonline.org/ld_indepth/technology/anderson-inman_rwq.html

Keywords:

Learning disabilities, adaptive technology

Study
Computers on Wheels (COWs): An alternative to 'each one has one,' Spring 2004

Author (s)
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Presented at the American Educational Research Association, April, 2005, Montreal

Description/Research Question(s)/Major Finding(s)
This evaluation study presents the findings of one school's experience using mobile laptop carts to affect change in teacher practice and student learning. The evaluation was structured around five research questions that focused on classroom practices, degree and type of technology use, academically focused time, student engagement, teacher technology skills, teacher attitudes towards technology, as well as student and teacher reactions to the program.

Research Questions/Results:

1. In what ways has the effectiveness of instruction through the use of student laptop computers been impacted?
    a. Results indicate extensive uses of cooperative/collaborative learning, project-based learning and the teachers acting as coaches or facilitators. Results indicate extensive uses of productivity tools, specifically draw/paint/graphics and electronic presentations, and Internet research with Internet browsers. Results also suggest wide use across the content areas. Meaningful uses of computers was observed to be extensive in approximately 1/3 to 1/2 of the classroom visits.

2. To what degree and in what ways have teachers integrated technology with classroom instruction?
    a. Teachers received no comprehensive technology integration training. They relied heavily on one another to extend their expertise, creating an informal community of practice leveraged from their grade team. The teachers used their educational philosophies and pedagogy to envision effective technology integration.

3. To what degree do teachers use methodologies that stress higher-order learning and student-centered learning activities?
    a. In 89% of the classroom visits, teachers ere observed extensively to be acting as a coach or facilitator of learning.
    b. Activities indicative of critical thinking and student engagement were seen in over 30% of the visits
    c. Cooperative/collaborative learning was observed extensively in 33% of the visits, and somewhat strong in 44% of the visits.
    d. Project-based learning was observed in 100% of the visits, and was observed to be a somewhat strong or strong application in 78% of the visits.

    e. Independent inquiry/research was observed somewhat strong in 44% of visits, and strong in 11% of the visits.

4. To what degree has the laptop program impacted teacher attitudes toward technology?
    a. The teachers were enthusiastic about the laptop program and felt the program had positively impacted their classroom instruction and positively impacted the fifth grade students. The teachers felt they were ready to integrate technology into their instruction. The teachers felt they had the support of parents, the community, the administration and the technical support necessary to be effective with technology integration and improve student learning.

The evaluation design was based on both quantitative and qualitative data collected from classroom observations, teacher surveys, and focus groups with teachers and students. Four fifth grade teachers from a K-8 school situated in a suburban city outside a large urban city in the southeast United States.

There was no baseline data, and therefore it is difficult to confirm any causations. There were not specific interventions as part of this initiative (i.e. professional development training) to effect change in teacher practice. Any professional development targeted specific software applications and not teacher practice and epistemologies.

The results from this research emphasized three factors as indicators for impacting technology integration: teacher technological knowledge and efficacy, pedagogical knowledge, and a supportive community.

URL
For complete report findings: http://idt.memphis.edu:16080/~mgrant2/cows_aera2005.pdf

Keywords:
shared laptops, fifth grade

Study
Does It Compute? The Relationship Between Educational Technology and Student Achievement in Mathematics

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Description/Research Question(s)/Major Finding(s)
This report takes the first step in determining whether computer use is making a difference in mathematics, and what kind of computer use has what kind of effect, on which groups of students. Data were drawn from the 1996 National Assessment of Educational Progress (NAEP) in mathematics, consisting of national samples of 6,227 fourth-graders and 7,146 eighth-graders.

The results from this study suggest that, as technology advocates have asserted, technology does matter to academic achievement, with the important caveat that whether it matters depends upon how it is used. The levels of use of computers seems not to matter, and extremely high levels of use may even be counterproductive. Possibly at such high levels students are using computers in unproductive ways, such as playing noneducational games. But when computers are used to perform certain tasks, namely applying
higher order concepts, and when teachers are proficient enough in computer use to direct students toward productive uses more generally, computers do seem to be associated with significant gains in mathematics achievement, as well as an improved social environment in the school.

The findings regarding home computers reinforce this point. Students using home computers frequently
had higher levels of achievement in eighth grade, but lower levels of achievement in fourth grade. Presumably this was so because the computer was put to different uses in the two grades. Perhaps eighth graders have more understanding of how to use the Internet than fourth-graders, and so can use it to provide supplementary information on academic subjects; perhaps eighth graders are more likely to use computers as tools for doing homework, including using word processors for writing papers and spreadsheets for doing calculations and tabulating data. Without having actual data on how home computers are used by students, it is only possible to speculate, but perhaps if home computers are academically productive for eighth-graders and not for fourth graders they are being used in substantially different ways.

There are various inequities in technology between groups of students. Disadvantaged groups seem to lag
behind in access to those aspects of technology that do affect educational outcomes, but not in access to those aspects of technology that do not affect educational outcomes. While minority, poor, and urban students are no less likely to use computers at school frequently, frequency of use is not associated with gains in achievement or social environment. Yet minority, poor, and urban students are less likely to receive exposure to computers for higher order learning, and poor and urban students are less likely to have teachers who have received professional

development on technology use. Thus, where technology matters, there are significant inequities; only where technology does not matter have these inequities been successfully erased.

The study suggests that federal and state policymakers should redouble their efforts to ensure that teachers are properly trained to use computers. Federal and state policymakers should make sure that the quality of the teacher training offered is high and intensive, since this training is such an important component of making technology use successful.

The study also suggests that teachers should focus on using computers to apply higher-order skills learned elsewhere in class. Computers should be a component of a seamless web of instruction that includes nontechnological components.

The primary focus of all technology initiatives should be on middle schools rather than elementary schools. The effects of technology appear to be much smaller in the fourth than the eighth grade, and so may not be cost-effective.

URL
For complete report findings:
http://caret.iste.org/index.cfm?StudyID=337&fuseaction=studySummary

Keywords:
Program Evaluation, socioeconomic status, staff development

Study
Early Evidence From the Field - The Maine Learning Technology Initiative: What Is The Impact On Teacher Beliefs and Instructional Practices?
2003

Author (s)
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Description/Research Question(s)/Major Finding(s)
One of the strategies Maine is using in preparing youth for the future economy is a statewide program to provide every seventh and eighth grade student and their teachers with laptop computers, and to provide professional development and training for helping teachers integrate the laptops into their classroom instruction. This paper examines the impact that the distribution of laptops to teachers and students in Maine is having on the beliefs and instructional practices of those teachers who are involved in the program. Seventh grade teachers who received laptops in the 2002/2003 school year were the focus of this evaluation. Data from surveys, case studies, interviews and classroom observations has been examined in order to more closely identify the laptop initiative's impact on teachers and teaching.

The Department of Education has initiated a professional development network consisting of several new roles and regional positions. 1) Each of the 243 middle schools in the state nominated a Teacher Leader who then received training that would enable them to serve as a leader within their school for the MLTI. These Teacher Leaders now serve as contact and support personnel for the classroom teachers in the buildings where they teach. 2) A second role that has been created is that of Regional Integration Mentors (RIM). A RIM is a teacher within each of the nine superintendent regions in the state who, in addition to their regular teaching responsibilities, assists MLTI staff in the development of a statewide network of professional development related to technology integration in middle schools and within each region. 3) The most recent roles created in the MLTI professional development network are Content Mentors and Content Leaders. Content Mentors are specialists and statewide leaders in specific content areas; mathematics, science, language arts and social studies. Content Leaders are content specialists within each of the nine superintendent regions. These individuals serve as resources, along with the RIMs and teacher leaders within each region, to help organize, establish, and maintain the MLTI professional development network within each region and the state. These positions have been created to facilitate greater integration of curriculum and technology and as support for the transformation of teaching and learning in Maine's classrooms.

Research Questions:
1. What is the impact on how teachers and students construct new knowledge?
2. What is the impact on teaching behaviors and instructional practices?
3. What is the impact on the contact and rigor of curriculum and instruction?
4. What is the impact on teachers' professional development?

Obtaining answers to these core questions will require a multiple-year evaluation. However, preliminary research has focused on determining how, and to what extent, pre-conditions or

forerunners for long-range achievements are occurring in the Initiative. In other words, are the laptops being used at this early stage in such a fashion that will lead to changes in teacher practices in the future? This report is focused entirely on the question of the impact of the laptop program on teacher beliefs and instructional practices.

A teacher survey was used to determine the uses and impacts of the laptops in the classroom. Seventh grade teachers, who were surveyed in December of 2002, reported that they were using laptops in many different ways, but most often in conducting research for lessons, developing instructional materials, and communicating with colleagues.

One of the items on the teacher survey asked teachers to rate their skill level in the use of laptops for instruction on a five point scale ranging from *Novice* to *Expert*. Not surprisingly, those who rated themselves as *Advanced* or *Expert* laptop users (28% of the respondents) indicated a more frequent use of the laptop for instructional purposes then did those who rated themselves as *Novice*, *Beginner,* or *Intermediate* users. For example, 51% of all teachers responding reported that they use their laptop to conduct research for lessons a few times a week or more. In the subgroup of advanced technology users, 74% of teachers reported that they used their laptops for this purpose. This group of teachers also reported significantly higher uses of laptops to produce homework assignments (60% versus 40%) and to assess student work (36% versus 21%). This evidence reinforces the idea that the process of incorporating the laptops into daily practice is developmental, and implementation and expertise will, in all likelihood, increase as teachers become more comfortable with the technology. This shift in teachers' beliefs and practices over time as they continue to experiment and reflect on how it is working is consistent with the pattern of implementation of educational reforms in general. Additionally, these findings correlate with national studies conducted by Apple Inc. (Classrooms of Tomorrow Research, 1995), which demonstrate that teachers experience five stages of development and change in their teaching beliefs and practices as they learn to integrate technology.

A number of teachers did report that their role in the classroom had changed, because they were willing to become facilitators of learning. Although further research is needed to confirm the significance of this, other studies found a similar transformation in the climate of laptop classrooms. In a study by Rockman Et Al (2000), teachers who were provided with laptops were compared with a group of teachers who were not provided with laptops to aid in their instruction. Over time, those teachers with laptops reported significantly higher levels of allowing themselves to be taught by students, using authentic assessments and encouraging students to explore their own research topics. In addition, the majority of laptop teachers decreased the frequency of direct instruction used in their classrooms from "almost every day" to "about once a week" during the course of the study. These factors were seen as early indicators of constructivist teaching practices.

Analysis of the MEPRI teacher survey data also found that teachers who ranked themselves as more advanced users of technology were using the laptops significantly more than those teachers who felt that they were beginners. It remains to be seen whether teachers will pass through this stage of more frequent use before moving into stages in which the laptops are used for more innovative practices in the classroom. However, it appears that most teachers would prefer to

take small steps in order to master the technology and avoid getting in over their heads, so to speak.

Unless administrators see the benefit of the laptop program and fully support its implementation, some teachers will not get on board.

Teacher support for the program has also waned slightly for those who remain abreast of the state's budget concerns. This is unfortunate, because in many cases, the program is not fully embraced because it is believed to be a passing novelty. Although there is probably no realistic way to remedy this problem, it is true that some educators feel more comfortable waiting to see the fate of the program before making major changes to their classrooms and curricula.

URL
For complete report findings:
http://www.usm.maine.edu/cepare/pdf/mlti/Impact%20on%20Teacher%20Beliefs%20and%20Instructional%20Practices%20as%20OCCASIONAL%20PAPER%203.pdf

Keywords:
Teacher attitudes, staff development

Study
E-books: Motivating Students To Read Independently
A research project report submitted to Mingyuan Zhang, Central Michigan University, EDU 590

Author (s)
David Grams

Description/Research Question(s)/Major Finding(s)
In January of 2003, I received my classroom set of handhelds (Palm m130). Although I had considered myself to be quite technologically versed, I immediately began experiencing a wide range of software and hardware problems. For this reason, I took my time integrating the Palms into our daily routine. Although we immediately began using them as word processors, it wasn't until April that I begin encouraging students to use their Palms as e-book readers. Not only did it take me some time to resolve the technical problems that had arisen, I was also having a difficult time finding quality e-books that my students would be interested in reading. Since we had been doing literature circles throughout the year, I decided I would allow a group of students that had just completed a novel set to choose an e-book to read together. Quickly, news of their enthusiasm and positive experiences began spreading throughout the class until everyone wanted to read books from their Palms. Within two weeks all of my students had given up traditional books in favor of e-books. Driven by popular demand, I was soon downloading ebooks daily for anyone willing to read them.

While not completely unexpected, I was unprepared for the fervor with which students began reading both inside and outside of class. All students seemed to be reading books faster than ever before. I saw more and more students reading during "choice time" and transition periods. In the halls I began hearing students discussing the books they were reading. Perhaps the fact that many were now reading late into the night, without their parent's knowledge, added an attractive subversive element to it all. After all, the Palm's backlit screen meant that their lights didn't have to be on. I also was able to gauge how many books my students were reading because I was the one loading them on to their Palms. By far, the most satisfying experience was witnessing students that previously had little interest in reading, doing so on their own accord.

A few weeks before the end of school, I developed and administered an attitude survey of my own design to gauge students' attitudes toward their use of Palms and e-books. I developed my own because I was unable to find another that would suit my purposes. Based on what I was observing in the classroom and what I heard from my students, I was sure that their handhelds were motivating them to read. My survey was comprised of five questions. I have included a representative sampling of students' responses on the three questions that specifically relate to the use of e-books.

Survey Responses:
The first survey question I asked students was if e-books motivated them to read more than traditional forms of literature do. Seventeen out of my class of twenty-three students claimed to have read more; four stated that they read about the same; and two students commented that they read less due to, what they felt were, the limited number of e- books that I had made available and the Palm's small screen size (see figure 1). Out of the seventeen that claimed that they read

more, nine students either implicitly implied or explicitly stated that they read significantly more than they had before being given e-books.

For question two, I asked students what they liked about reading e-books. Students' responses tended to focus on two areas: 1) Portability. Students appreciated the convenience of being able to carry around their books on a PDA. 2) Features. Students liked that fact that they could easily place and bookmark or make notes in their books without losing them. Most also liked the Palm's backlit screen because it allowed them to read in the dark. Fewer still, commented on the Palm's ease of turning pages.

On my third question I asked students what they didn't like about using their handhelds as readers. Nearly everyone mentioned the Palm's small screen size. Fewer, but yet still a significant number also mentioned that they would have liked a larger selection of e-books to choose from.

Although my study lends credence to the view that e-books improve students' motivation to read, one must always consider how confounding variables have influenced the testing or observable results. In this case, I feel the most significant are sample size and testing methodology. First, is sample size. To my knowledge no one has ever attempted to quantify the effects of handheld computers on reading motivation. Clearly, additional studies need to occur in other classrooms across the nation before a definitive connection can be made. Second, is the measurement vehicle. Opinion surveys, while important, don't necessarily lend themselves to the kind of quantitative measurable results teachers, administrators, politicians, and parents demand.

URL

For complete report findings: http://goknow.com/GettingStarted/Documents/Grams_D_e-books.pdf

Keywords:

Handhelds, reading, e-books

Study
Effects of using the Anytime Anywhere Learning Model (laptop program) for the enhancement of problem solving and critical thinking skills

Author (s)
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Description/Research Question(s)/Major Finding(s)
Research question:
Will the Anytime Anywhere Learning Program improve problem solving and critical thinking skills of students in K-12?

In the fall of 1996, Microsoft Corporation and Toshiba American Information Systems launched the Anytime Anywhere Learning Program, also called the Laptop Program, at 29 "pioneer" school sites across the United States. Teachers and students were given laptop computers loaded with Microsoft products. The pilot program was designed to demonstrate that providing every student with access to a laptop and eventually access to the Internet would produce substantial educational benefits by learning anytime and anywhere. There are now over 800 schools involved in this program.

Schools in the industrial age were structured to support a model of education in which teaching was telling, and learning was memorizing. We are now in a global economy, where the knowledge and skills of a nation's workers are the key to its competitive success. Students need to learn about critical thinking, research, and communication tools that they will need to meet the challenges of the future. New views of cognition support a constructivist philosophy that suggests that the advanced skills of comprehension, reasoning and experimentation are acquired not through passive reception of facts, but through interaction (Owston 1997). This takes advantage of the student's ability to learn through experience, where analyzing and synthesizing can take place. This major shift in teaching style with the advent of computers and the Web is allowing students a greater autonomy in their learning, which they seem to enjoy.

Research informs us that 80% of what we remember comes from experience, and 95% from what we teach others (Rockman et al). Does the information and communication technologies like the Web support experimental approaches to teaching and learning?

For the implementation of a laptop program to work, the plan is the secret to the success. Rockman et al (2000) recommend that planning the project is the most important task. With a solid plan, the implementation will move confidentially along the right path. The task of implementing technology is never easy, there are many pitfalls. Stated upfront though there can be preventive action in place.

It was noted from the Rockman et al research (2000) that access to technology has increased for all, although opportunities for individual access are still greater for Laptop students. Laptop students consistently showed deeper and more flexible uses of technology than their Non-Laptop matched groups. Laptop teachers showed significant movement toward constructivist teaching

practices, and indicated that computers played a major role in that change. However these attributes did not appear on the standardized assessment measures used in the Rockman et al (2000) study. This does not mean that the Laptop program did not impact academic achievement, but possibly the measures used in the study were not able to identify the outcomes.

Educators have to develop effective planning programs so that student potential and performance can be stretched in productive directions. Educators have to teach their students to become skilled thinkers, researchers and inventors. A curriculum needs to be designed that is suitable for the age of Information, and one that can be used with the laptop computer program. With the Internet and a bank of technological equipment that is needed to support it, we may see the effect of "improved learning" in the areas of problem solving and critical thinking.

URL
For complete report findings: http://www.coedu.usf.edu/itphdsem/eme7938/lh800.pdf

Keywords:
Problem solving, critical thinking

Study
Evaluation Report Year 2, Beaufort County School District, South Carolina, 1998

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Description/Research Question(s)/Major Finding(s)
The focus of the current evaluation of the Beaufort County School District middle school laptop initiative is those 1996/97 sixth graders who had at the end of the 1997/98 school term now used their laptops as electronic notebooks for two years.

Research Question: Are there observable differences in the academic performance of these students when compared to their peers who had not used laptops as electronic notebooks over the two year academic period?"

An adjunct analysis focused on the relationship of school attendance and participation in the laptop project.

1. Seventh graders participating for two years in the laptop project significantly outscored their non-participating peers on the MAT7. However, significant differences in achievement between the two groups existed before the project.
2. Seventh graders who have participated in the laptop project for two years tended to maintain their level of academic achievement level over time, while non-participants experienced a decline in standardized achievement level.
3. Students who were laptop participants for two years and who were on free and reduced lunch benefited most from the project. Their average standardized scores actually increased from fifth to seventh grade. In fact, by the end of the second year, these students were scoring as well as students not on free or reduced lunch who were not laptop participants.
4. Students who were not laptop participants and who were on free and reduced lunch had the greatest declines in academic achievement over the two year period. Their average standardized scores decreased significantly from fifth to seventh grade.
5. Non-participation in the laptop project was associated with negative achievement gains for boys. Boys who did not participate during the two years of the project experienced a significant drop in standardized achievement scores from fifth to seventh grade.
6. Non-participation in the laptop project was associated with negative achievement gains for students classified by race as "other." Their average standardized achievement scores dropped significantly from fifth to seventh grade.
7. Though computers are at times perceived to be more in tune with the male domain, girls participating in the laptop project continued to slightly out-perform their male counterparts at the end of the second year of the project on standardized achievement tests.
8. A key to learning and achievement is engagement in the educational process. Participation in the laptop project was associated with fewer days absent and fewer tardies. Students with laptops attended school more regularly and scored better on achievement tests.

9. The project was recommended for continuation, with a suggestion that special efforts be made to involve more students from lower socio-economic levels.

Attendance
The results revealed that laptop project participants missed on average 6.9 days of school that year. On the other hand, students not involved in the project missed an average of 10.3 days. Statistical analysis indicated that the difference was significant. Seventh grade laptop students who had been participating in the project for two years missed significantly fewer days of school than those not participating. Similarly, data regarding number of tardies revealed that laptop participants were late significantly fewer times than non-participants.

URL
For complete report findings: http://www.beaufort.k12.sc.us/district/ltopeval.html

Keywords:
achievement, middle school, low income, gender, race, attendance

Study
Evaluation Report, Year 3, Middle School Laptop Program, Beaufort County School District, 1998-1999

Author (s)
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Description/Research Question(s)/Major Finding(s)
During school year 1998/99 the Beaufort County School District completed the third year of the Middle School Laptop Project. The project began in the 1996/97 school year. At that time sixth graders at the district's three middle schools were the participants in the program. The project was expanded in the 1997/98 school year to include the new cohort of sixth graders that year. Thus, students in both grades six and seven were participants. For the 1998/99 academic year, the laptop project was expanded yet again to include the new cohort of sixth graders. As a result, the laptops were now in use at all three grades at the middle schools. At this point, the original sixth grade laptop users (1996/97) were now in the eighth grade, completing their third year of use of the computers.

Findings:
1. Both teachers and students continued to respond positively regarding the impact of the laptop computer project. However, third year student participants were less positive than other groups, as were first year teacher participants.
2. Students using the laptops continued to score well on standardized achievement tests. The third year users in particular maintained their scoring advantage over non-users.
3. Laptops were most often used in English/language arts, history/social studies, and science. They were not used to any extent in mathematics classes. Amount of use was also dependent on grade. Third year students, who were eighth graders, reported that their teachers, who were first year participants, used the laptops in classroom activities less than other teachers.
4. Teachers personally used the computers most often for lesson planning or research.
5. Students most often used the laptops for homework, classroom note taking, and completing writing assignments.
6. Two of biggest problems identified with the project were dispersion of laptop students - mixing laptop and non-laptop participants in the same class, and the mechanical reliability of the laptops. Teachers also indicated that lack of keyboarding skills among students was a problem, though students disagreed.
7. Both students and teachers thought that use of the laptops would have more impact ultimately on high school academic performance than middle school achievement
8. Students who have traditionally not found success in schools, who participated in the laptop project, continued to perform better than those who did not. As was the case in 1997/98, free/reduced lunch students using laptops scored approximately the same on standardized achievement tests as students not on free/reduced lunch who were not laptop participants.
9. Female students participating in the laptop project scored as well as male participants on achievement tests.

10. Year 3 evaluation results supported continuation of the laptop program.
11. Though the project was recommended for continuation, recommendations were made for continuing to improve it. These included: continued staff development, continued efforts to provide all students with laptops, continued efforts to engage historically unsuccessful students in laptop use, study of why eighth grade student and first year teacher participants are less enthusiastic about laptops than others, and study of why some schools appear to generate different academic outcomes related to laptop use than others.

A major issue related to using the laptops has to do with how to group students who do and do not use them. The Beaufort laptop project is voluntary. Students and their parents decide if it is worth the expensive, etc. Some choose not to participate. In 1998/99 laptop students were interspersed with non-lap top participants in the same classroom. Both students and teachers found this to be a major problem. In interviews with students, teachers, and administrators there was almost total agreement that laptop students should be grouped together in the same sections of courses to facilitate more efficient, better coordinated use of the computers.

URL
For complete report findings: http://www.beaufort.k12.sc.us/district/evalreport3.htm

Keywords:
number of years involved, low income, gender, African American students, test scores

Study
Evaluation Report – Year 3, High School Laptop Computer Program, Liverpool Central School District, NY, 2002-2003

Author (s)
Kenneth R. Stevenson

Description/Research Question(s)/Major Finding(s)
This report provides an analysis of Year 3 of the Laptop Program at Liverpool High School in the Liverpool Central School District. Year 3 was a critical year in the Program in the sense that the initial class of tenth graders who began using laptops in 2000/2001 completed their third and final year of participation as twelfth graders. The Year 3 evaluation data provided the first opportunity to view the impact of the Laptop Program on a cohort of students who had been laptop users throughout their three year high school experience.

The evaluation approach used a combination of data sources. Questionnaires were again used to gather the perspectives of parents, teachers, and students. The questionnaires allow the evaluator to compare perspectives of these Year 3 groups with respondents in past years. In addition to surveys, data were gathered using classroom observations, and interviews of students, teachers, and other staff.

Data were also examined relating to attendance, behavior, and grades. These sources allowed the researcher to seek out any differences in actual student performance that might be related to participation in the Laptop Program.

With three years of data, the picture of how laptops are used at the high school is becoming clearer. Typically in the tenth grade, students, parents, and teachers find the laptops to be a good tool in the learning/teaching arsenal. Use is relatively high at this grade, and a majority of those involved at this level find the project beneficial and worth continuing. However, as students continue on to the eleventh and twelfth grades, laptop use declines, and declines noticeably. With the decline in use comes increasing doubt about the value of the computer to the learning process—and a growing unrest related to the value of the computer to the learning process—and a growing unrest related to the value of the laptops versus the costs parents must bear so that their children may participate in the Program.

Few would argue that the district-level administration has been intent since the inception of the Laptop Program to make sure it worked and was continued, even when those at the school, and to an extent in the community, were uncertain about the worth of the project.

Because of the concerns that the central administration was trying to run their school, some school-based employees have begun to practice various forms of passive-aggressive behavior toward the Program. That is, being less than fully supportive of it from an implementation perspective. As one student related in an interview, "One of my teachers told me not to bring my laptop to class. We weren't going to use them and they'd just be in the way."

Other forms of resistance to the Laptop Program were less passive. As one school-based staff member related, “We’re not using them because we don’t see their value.” Or, as another employee stated, “If the new superintendent (incoming for 2003/2004) isn’t willing to put the control of the Laptop Program at the school-level, the Laptop Program will not continue at this school.”

The primary recommendation that the evaluator makes after three years of evaluating the Laptop Program is this:

> Adults involved in any way with the Laptop Program (whether teachers, parents, or administrators at both levels), must reaffirm that the purpose of the school, and the purpose of such projects as the Laptop Program, has to be about the students – not about the politics of adults. Everyone associated with the Laptop Program should reassess his/her position on the Program in terms of what is in the best interests of children. Then, the various factions need to come together with honest, open dialogue about the Program. From that discussion should come a consensus of where the district should go from here regarding continuing the Laptop Program – and that decision must be driven by what is in the best interests of students.

URL
http://www.liverpool.k12.ny.us/Laptops/3rdyearevl.pdf

Keywords:
high school, attendance, behavior, achievement, leadership

Study
From Teaching Technology To Using Technology To Enhance Student Learning: Preservice Teachers' Changing Perceptions Of Technology Infusion

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Description/Research Question(s)/Major Finding(s)
This article uncovers changes that occurred in preservice teacher's perceptions of technology infusion based on evaluation findings from the first and second years of an ongoing Goals 2000 Preservice Technology Infusion Project. The project design involved a summer institute each year, where teams of education faculty, content faculty, and K-12 teachers worked together to learn about specific computer technologies and their applications, planned for infusing technology into their respective courses, and created links among preservice teachers, and teachers and students in public school contexts. Teams participated in common professional development experiences and were supported during the summer and throughout the year to plan, implement, and assess technology infusion activities.

Research question:
How can technology assist educators and students as they work within a constructivist teaching and learning environment?

To design the professional development experiences and preservice teacher technology infusion model, we relied on a needs assessment conducted in the School of Education, which indicated where faculty were most and least proficient (Vannatta, 1999b). This assessment was based on two surveys that measured level of technology proficiency, frequency and type of classroom integration of technology, course implementation of NCATE technology standards, barriers to technology integration, and desired topics and formats for technology training. A correlational analysis of this data found that faculty members do not need to be proficient in a large variety of technology applications to successfully integrate technology.

Focus group results from preservice teachers during the first year were mixed. Students understood the concept of integration, but had trouble ex-pressing a vision of a technologically rich classroom. They commented, "We learned about it but never got to apply it." Students maintained a vision of a technology-rich classroom as one that has "lots of computers for students to spend lots of time on, playing games and tutorials." Faculty felt they had exposure to many programs, but insufficient mastery to integrate these into their courses. They therefore tended to rely on external presenters to infuse technology. Preservice teachers saw technology as an "add on" in their courses; they saw the project as beneficial but wanted much more exposure in their program and wanted to see technology integration.

As a result of the first year evaluation, changes in the structure, focus, and goals of the project occurred. Prior to the project most preservice teachers reported moderate to high proficiency in general computer use, word processing, email and Internet. T tests of related samples indicated significant increases in all proficiencies except LCD panel use, including overall proficiency (p <001).See (1999) for a complete report of the survey findings. One of the largest increases occurred in the area of instructional methods of technology integration, which rose from 15.9% to 68.9%, consistent with the goals of the year two participants. This addressed the main suggestion of preservice teachers during the first year evaluation process.

Focus groups findings as well as results from examining the pre/post qualitative question on the survey that focused on changes in preservice teacher's vision of technology, suggested a number of common themes across preservice teachers' experiences in these courses:

- "We want more!" While what they experienced was highly beneficial, many suggested they needed much more, much earlier in their program to be prepared to enter today's schools.
- "We have no choice." Students felt that knowledge about using computer technology was absolutely essential on the job market, and while most embraced it, all felt it was mandatory in the teaching profession.
- "I need step-by-step instruction." Many voiced an appreciation for opportunities to explore programs hands-on, with step-by-step guidance from someone who knew what they were doing.
- "Collaboration is essential." In addition to step-by-step instruction, many thought that collaboration with peers was essential to their learning.
- "Technology is wonderful!" By and large, students saw technology as something to enhance their teaching, to motivate students, to make learning more interesting, to address various learning styles, to open up new worlds that cross geographic boundaries, and to improve student learning. Students tended to base these claims on their own observations and impressions, rather than substantiate them with systematic evidence or research. That is, in general, students took a noncritical stance towards technology and what it can do.
- "Before I Thought… and Now." Students commented on their changing notions of the role of the teacher. Before, some thought technology would be taught in the computer lab. Now they saw themselves as facilitators, using technology to enhance student learning. "Before this class I didn't know how to use technology without making it the main focus. Now I can really see it being part of my teaching" one commented.

As a result of all the authors have learned on this project, both the program and the evaluation have been revised to focus more closely on instructional methods for infusing technology. Most preservice teachers and faculty recommend expanding technology integration to more education courses earlier in the program.

URL
For complete report findings: http://www.aace.org/dl/files/JTATE/JTATE-09-01-105.pdf

Keywords:
Teacher Education, Staff Development, Teacher attitudes

Study
Henrico County Public Schools Ibook Survey Report

Author (s)
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Submitted by Development Associates, Inc., February 2005

Description/Research Question(s)/Major Finding(s)
The Henrico County Public School (HCPS) system has implemented a technology program that provides all middle and high school students, teachers and administrators with iBook laptop computers. The goal of the program is to integrate electronic technology throughout the curriculum, including staff development courses for teachers. During the 2003-2004 school year, over 20,000 students participated in the program.

As the iBook contracts expire, the HCPS School Board must make decisions about the future of the program. To guide their decision-making, the School Board sought information on the experiences and opinions of program participants: the students, their teachers, their parents, and school administrators. This information was collected by conducting surveys of all members of these populations. The questionnaires, while developed specifically for each group, included a number of common core questions so that comparisons could be made among population groups on key issues. Each questionnaire included at least one general open-ended question where the respondent was invited to type or write their response. This mechanism ensured that all program participants were able to freely express any view on the iBook program.

29,022 people participated in the survey: 20,396 students (10,025 middle school students and 10,371 high school students), 1,301 teachers, 223 administrators, and 7,102 parents.

The majority of middle school students believe that the iBook makes research easier (9 in 10) and helps them to be more organized (7 in 10), but only 6 in 10 believe that the program helps them to do better in school. About half of the students believe that the iBook is very useful in the context of learning in specific subject areas. While student views on the utility of the program do not differ by gender, they do differ by magisterial district, race/ethnicity and free/reduced lunch. Users problems include the frequent need for repairs, at a rate of with 6 in 10 between September, 2004 and January, 2005, and the fact that 7 in 10 cannot print from their iBooks at home.

he majority of high school students believe that the iBook makes research easier (9 in 10) and helps them to be more organized (7 in 10), but only 5 in 10 believe that it helps them to do better in school. Over 5 in 10 believe that the iBook is useful in history class, and 4 in 10 feel that it helps in science classes and another 4 in 10 report that it helps in English or language arts.

More middle than high school students are satisfied with the Apple Macintosh. Of those who expressed a preference, 4 in 10 middle school students prefer the Apple Macintosh and 5 in 10 high school students prefer a Windows-based system. Regarding the efficacy of the Help Desk, over 6 in 10 middle school students reported that it "solves their problems," while over 4 in 10 high school students hold this view.

The teachers use the iBook and feel that it is a valuable tool. Some 8 in 10 reported having an iBook during the 2003-2004 school year and felt that they could use their own judgment in deciding how to integrate them into classroom instruction. While the technology program has increased teachers' workload, they feel that the program has made learning more interesting for their students, encouraged them to do research, and believe that students who do not use iBooks are at a disadvantage.

The amount of time teachers devote to the iBook for instruction is related to school level, with high school teachers finding more applications than middle school teachers. Overall, just under 2 in 10 use it every day, with 5 in 10 allocating less that 25 percent of classroom time to technology-based instruction. Some 6 in 10 have their students use the Internet once a week or less often. Over 6 in 10 never assign work that must be performed exclusively on the iBook and always make paper ("hard") copies of assignments available for students without a machine.

The administrators' views and experiences with the iBook program strongly parallel teachers' with a few notable differences. Concerning program implementation, over 7 in 10 believe that every student should have an iBook and that those who do not are at a disadvantage educationally. They do not agree among themselves on whether or not students should be required to take the iBook home from school.

The students' parents generally favor the technology program, but opinions vary, or are sharply divided, on some specifics. Over 7 in 10 parents support retaining the iBook program or a similar program. Support for retaining a technology program varies by the racial/ethnic identity of the student, but not by any of the other characteristics listed above. The parents are divided on whether HCPS should spend more money on the program, however. Some 4 in 10 favor spending more on the program while 3 in 10 are not. These differences of opinion vary by magisterial district and the racial/ethnic identity of the student. Over 5 in 10 parents prefer that their children use a Windows-based system, while 1 in 10 prefers the current Apple Macintosh and over 3 in 10 have no preference.

URL

For complete report findings:
http://henrico.k12.va.us/Announcements/tech_eval/Henrico%20County%20Report_22Feb05.pdf

Keywords:

Student attitudes, teacher attitudes, parents, tech support

Study
How Ubiquitous Computing can Support Language Learning

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Description/Research Question(s)/Major Finding(s)
The challenge in an information-rich world is not only to make information available to people at any time, at any place, and in any form, but specifically to say the right thing at the right time in the right way. A ubiquitous computing environment enables people learning at any time and any place. But the fundamental issue is how to provide learners right information at the right time in the right way. This paper tackles the issues of right time and right place learning (RTRPL) in a ubiquitous computing environment.

Especially, we focus on language learning as an application domain of this research. That is because language is much influenced by situations. The user of this system is an overseas student of a University in Japan, and wants to learn Japanese Language. The other user is a Japanese student who is interested in English as the second language and plays an important role of a helper for an overseas student. The learners with PDA (Personal Digital Assistant) store and share the useful expressions that are linked to any place in everyday life. Then, the system provides each learner the right expressions at the right place. For example, if the learner enters a hospital, then the right expressions at that place are provided at that time for RTRPL. It is very important to encourage not only individual learning but also collaborative learning in order to augment practical communication among learners and accumulation of the expressions.

Japanese polite expressions are divided into two types that are honorific words and modest words. The former is used to express a speaker's respect for a conversational companion. The latter is used to express a humble attitude of a speaker. For example, in a word of "hanasu", its honorific word is “ossharu," and its modest one is "mousu." The alteration of Japanese polite expressions usually occurs in the verb, noun, adjective, and adverb. Moreover, there are three levels of polite expressions (LPE): casual, basic, and formal. There are two kinds of changing patterns: the first one is irregular change to a different word; the second one is regular change incorporating with a prefix and/or postfix word. According to the former, there is no limitation and pattern like an irregular verb. This makes Japanese expressions difficult for the overseas learners. Therefore, we have developed the subsystem of CLUE, the main aim of which is to provide the learner the appropriate polite-expression in the specific context. CLUE consists of the three subsystems for supporting ubiquitous language learning: sentences, polite expressions, and vocabularies.

Learners, overseas students, store useful expressions into the database of CLUE, or ask questions with CLUE when they have some problem in everyday life. Japanese students refine the expressions or answer their questions. When learner is walking around, CLUE provides the adequate expressions and/or questions at RTRP. The users input their individual personal data, e.g., name, gender, work, age, relationship etc. When the user talks to another user, the CLUE gets the information of the other via the infrared data communication of PDA, and then it suggests the suitable polite expressions for the user.

This paper describes a computer supported collaborative learning (CSCL) in ubiquitous computing environment. In the environment called CLUE, the learners provide and share individual knowledge and other knowledge on the WWW and discuss about them. In the future, we will try to evaluate CLUE.

URL
For complete report findings: http://www-yano.is.tokushima-u.ac.jp/ogata/clue/ogata-kest2003.pdf

Keywords:
culture, English as a second language, handheld computers

Study
In Search of Successful Technology Integrators

Author (s)
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Description/Research Question(s)/Major Finding(s)
Have you ever wondered what skills, knowledge, access, support or training the teachers who are successful at technology integration possess? Do they arrive in the classroom fully equipped with a full range of high-level technology skills? Do they teach a particular grade level, content area, or student population? Do these “techie” teachers have an abundance of technology resources, training, and support at their disposal? What is the magic recipe that teachers can follow that will guarantee some level of success at integrating technology into the classroom curriculum?

Several data collection methods were used to gain an understanding of the experiences of the teachers as they moved through the training course into the implementation process for integrating technology into the curriculum.

Initial attempts at integrating technology indicated that all of the teachers used technology in ways that replicated their current teaching practices, which meant six of the seven participants created teacher-directed technology- based lessons. Those who developed learner-centered integrated lessons followed more constructivist principles in the classroom. Their classrooms were learner-centered environments that focused on discovery and problem solving. This observation was consistent with the literature that teachers who already follow constructivist principles have less difficulty using technology in learner-centered activities (Fulton, 1999; Mehlinger, 1995).

The results of this study indicate that the individual characteristics of the teachers, the content area they teach, their previous teaching experience, their career goals, and their classroom environment have an impact on how and to what degree they integrate technology into their classroom curriculum during and after training in the processes of technology integration. A course designed to train teachers in technology skills and technology integration raises the skill levels of the teachers and increases the use of technology in the classroom, but the course used in this study did not alter the teachers’ established teaching methods. This researcher hypothesizes that such alterations require a more comprehensive effort than one class.

Training in the integration of technology that is a combination of both integration of technology and skills training is more beneficial than basic technology skills training alone, but technology training that is aligned with the curriculum and relevant to what teachers do in the classroom is most effective (Trotter, 1999). The findings of this study support previous findings that the individual teachers’ beliefs, previous teaching experiences, content areas, and classroom environments directly affect their teaching practices and therefore influence their uses of technology integration in the classroom.

This study extends the literature with two additional factors that directly impact teachers' use of technology in the classroom. First, the career goals of the individual teachers not only affect how the teachers envision the use of technology in the curriculum but also affect the extent to which they apply the skills and knowledge obtained during the training program to their current classroom environment. Second, conflicts that occurred as teachers experienced simultaneous multiple change processes directly affected the teachers' skill growth, concerns, and levels of use of technology integration. Restructuring of schools initiates change that affects the roles of teachers, learners, and technology in the classroom. Technology training initiates change for the individual through new skill acquisition and application. In addition, teachers experience change as they transfer the skills and knowledge gained in the training environment to the classroom. Teachers therefore may have difficulty moving through each of the individual change processes due to difficulties or conflicts encountered in other change processes. Again, this researcher hypothesizes that the complexity of change processes toward technology integration requires a comprehensive effort.

Training program developers and instructors must address these two factors if the individuals enrolled in their programs are to move beyond training to implementation in their own environments. First, technology integration that promotes effective uses of technology in teaching and learning must be an integral part of all education programs and not limited to teacher-training courses. The educational value of integrating technology into the classroom curriculum must be emphasized in all education programs. Technology integration must become a component of the entire education process and not be confined to technology training courses.

URL
For complete report findings: http://www.nesinc.com/PDFs/2003_15Willis.pdf

Keywords:
Staff development, teaching and learning

Study
In-Service Teacher Development for Fostering Problem-Based Integration of Technology

Author (s)
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Description/Research Question(s)/Major Finding(s)
There is growing emphasis in educational reform efforts on learning models based on students' active construction of knowledge and skills. Learners must learn how to learn if they are to be successful in a rapidly changing world. Two similar learning models, problem-based learning and project-based learning, embrace this perspective on students' construction of understanding and show great promise for helping learners acquire knowledge and skills while using technology as an authentic tool. Although the specifics of problem- and project-based learning vary somewhat, they share an emphasis on situated learning in authentic contexts. Authentic problems anchor the curriculum and provide a vehicle for both problem-solving and content learning. In general, this approach is characterized by:

(1) Use of an ill-structured problem or driving question that provides opportunities for student investigations and problem-solving;
(2) Student analysis of the overarching problem or question to identify a specific problem for investigation (e.g., identifying what is known and unknown);
(3) Student-conducted investigations or actions that typically result in the development of artifacts or products;
(4) Collaboration among students, teacher, and community; and
(5) Student presentation of a final report or solution that summarizes the process and findings. Technology can play an integral role throughout this process as a tool for acquiring relevant information, gathering and manipulating data, and producing and presenting the culminating presentation in multimedia format.

For teacher educators, a key issue is how to best help in-service and pre-service teachers learn to apply problem-based methods that effectively integrate technology. Little (1993) argued that traditional models of professional development are not adequate to the task of preparing teachers for the challenges of teaching in the climate of reform. Because of the complexities of pedagogies demanded by learner-centered approaches, deeper and more meaningful professional development experiences are needed.

This paper reports on the initial professional development activities of an Indiana-based Technology Innovation Challenge Grant project. The process consisted of an initial problem-based learning modeling activity, designed to show teachers the problem-based method in action, followed by a semester-long, on-site course focused on technology integration and problem-based learning approaches.

Early in the semester, participating teachers along with eighteen students from grades 6-12 and six preservice teachers from Purdue took part in a two-day problem-based learning activity involving a significant environmental problem (water quality) in the local community. The

purpose of the activity was to help the teachers understand the problem-based learning process, the roles of teachers and students, and the use of technology as a supporting tool.

During the two-day activity, mixed teams of participants first were presented with the driving question on water quality, "What's in our water, why is it there, and what does it mean to us?" Teams designed their own investigations within the framework provided by the overarching driving question and conducted their investigations. In most cases teams traveled to field sites to collect water samples and used available water test kits to assess what was in their samples. Finally, each team produced a multimedia report of their investigation and findings, which was then shared with the other teams on the second day. Rather than teaching about technology, the emphasis in this approach was on using technology as an authentic tool to gather background information (e.g., Internet searching), collect data and artifacts (e.g., digital camera photos of field sites, Excel graphs of data), and assemble and present multimedia reports of the investigations (e.g., PowerPoint presentations).

Following the modeling activity, the teachers participated in a semester-long in-service development program that consisted of a specially tailored version of the EDCI 564 Purdue course. The professional development course focused on development of participants' knowledge and skills to integrate technology within a problem-based context.

This appears to be a promising approach for helping teachers to integrate problem-centered applications of technology in their own classrooms.

** In the report "Barriers to Teachers' Adoption and Use of Technology-Supported Learner-Centered Pedagogies, 2002-2003," researchers found that the number of teachers that implemented PBL units in their classrooms was extremely small.*

URL
For complete report findings: http://www.edci.purdue.edu/ertmer/docs/site2001challenge.PDF

Keywords:
Staff development, problem-based learning, project-based learning

Study
It's OK to be Stupid: Contributions Professional Community Makes to Exemplary Technology Use

Author (s)
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Description/Research Question(s)/Major Finding(s)
At any schools there are individual teachers who make creative use of technology in their instruction. Through the site selection process for this study we encountered numerous instances of such schools and teachers; what was much harder to find were the sites where all or most teachers were incorporating creative approaches to technology and where the school's staff shared the vision for technology as a support to teaching, learning, and school improvement. The schools in the Exemplary Technology Supported Schooling Case Studies Project were selected, in part, because together their staffs were thoughtfully integrating technology into classroom pedagogy and had identified how it could support student achievement. There are considerable levels of technology access and strong technology support programs at these successful sites. The school's technology leaders had obviously taken efforts to make it easier for teachers to learn to use technology to enhance teaching and learning, and to make it a priority to do so. What emerged in the data was the contribution to the use of technology made through the professional community in the school.

Because strong professional community is a vehicle for schoolwide knowledge processing, creating professional community enhances school capacity for organizational learning. Teachers no longer work in isolation but collaborate within a professional culture. Reflective dialogue, open sharing of classroom practices, developing a common knowledge base for improvement, collaborating on the design of new materials and curricula, and establishing norms related to pedagogical practice and student performance are hallmarks of the professional culture and are demonstrably related to student achievement.

Our tentative conclusion for these six cases is that it appears that in combination with certain enabling conditions the teachers' shared need to learn technology contributed to the development of professional community. Likewise, the professional community at the school contributed to more integrated and focused uses of technology as well as to the refinement of the schools' vision and necessary support system for technology use.

The technology support environment at each school, especially the commitment each school site made to individuals' learning, as evidenced by the strong professional development programs the sites put into place, and technology integration support staff, was key for helping teachers to focus on how technology could support teaching and learning. We then review how the technology leadership by teachers and administrators was instrumental in not only putting the technology support into place, but also in creating a supportive climate where teachers needed to learn.

Technology support in schools can be categorized according to its content---technical or instructional---and the method by which it is delivered. Instructional support focuses on integrating technology use into curriculum and to enhance different teaching methods. Technical support is focused on the access to, and operation and troubleshooting of hardware, software, and network resources. Support for both content areas is important for teachers intending to use technology effectively in the classroom.

All of the schools had a *classroom-based* student-computer ratio that met or exceeded the national average (which also counts computers located in labs). Two sites had a 2:1 ratio and 2 sites had a 1:1 ratio in their classrooms. For the schools where the classroom-based computer student ratio was higher, 5:1 and 4:1, the arrangement of the technology in the school was somewhat flexible so additional computers could be brought into the class or made available to the students. In addition, most if not all of the computers were networked, so file sharing and Internet access was available. The teachers all had some sort of large screen display capability available for them to show a computer screen's content; digital cameras, scanners, and printers were also available to the teachers. Together these features added functionality to the computer's use. This high level of access is significant because it meant that technology was always readily available as a tool to the teachers and students. It also meant that teachers' work to integrate technology could focus on curriculum and pedagogical concerns without worrying about scheduling conflicts or complicated logistics necessary to rotate all of the students through a limited number of computer stations.

The technical support---troubleshooting, repair, and maintenance---was excellent at all six schools. Not once did any of the teachers to whom we spoke complain about the reliability of their equipment. Several districts explicitly stated that they made providing excellent technical support a very high priority, explaining that without this, teachers would likely be unwilling to plan for the use of technology.

These schools and districts had all either sought additional resources or re-allocated existing resources so they could dedicate experienced technology-using teachers to help other teachers on a full-time basis with technology integration.

All the schools created technology support systems for individuals. And in some cases they explicitly encouraged teachers to collaborate and support one another in learning. What stood out in the data was how often teachers at these schools described the whole school environment as one where they felt trusted, where risk-taking was supported, and where any experimentation that fell flat would not be held against them. Thus, in addition to the technology support environment at each school, there seemed to be an emotional support system that was emphasized by the technology leadership teams.

Teachers in these schools had or made time to meet, and they used this time seriously, to discuss curriculum and instruction, technology, and student achievement. At Mountain Middle School, for example, "pretty much all" teachers belonged to a study group that they attended in addition to grade level team meetings. Both team and study group meetings were focused on critical issues that brought technology, curriculum, and student achievement together.

Teachers, for the most part, view technology differently than their subject matter competence or instructional skills. Instead, they see it as an area of constant change, where no one is "better" in all areas, and where "we're all in it together." This reduces the anxiety that many teachers feel about revealing their weaknesses or lack of skill. Expertise is spread widely within the buildings, and the open communication systems spread knowledge about who is experimenting on different instructional strategies that incorporate technology. Because technology use is easier to *see* than to disseminate in written form, teacher sharing through observation and intensive discussion is becoming more normative.

URL
For complete report findings: http://education.umn.edu/CAREI/Reports/Contributions_Tech.pdf

Keywords:
Professional learning communities, technology support, staff development

Study
Laptop Computers as a Tool for Authentic Instruction, 2001-2002, Florida Title I Elementary School

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Description/Research Question(s)/Major Finding(s)
The purpose of this study was to examine the use of the laptop computer as a tool in authentic instruction with students from low-socioeconomic backgrounds. The design for this study is a descriptive case study employing ethnographic methods, including student artifacts, videotapes, and interviews.

The teachers involved in the study were given their own laptop computer and training on various application programs. They were also provided with access to a set of laptop computers for their classroom, along with other peripherals, such as scanners and digital cameras, for student use. The project was implemented in two second-grade classrooms and two fourth-grade classrooms and was enthusiastically endorsed by the principal.

Research Question:
Under what conditions do computers have the most benefit for students?

Themes that emerged:

- Instructional conversation between the teachers and students
    - In two classrooms (one at each level), the teachers emphasized a vocabulary of “techie” terms with the students. Both teachers felt it was very important that the students were taught the application before it was used in the curriculum.
    - In the other two classrooms, the instructional conversation was about the lesson and not the technology.
- The classroom management of the teachers
    - In the two classrooms that emphasized the technology, the teachers posted the various rules on the classroom and instructions for using the computer on the walls around the classroom.
    - In the other two classrooms, student work was posted on the walls rather than rules.
- The observable behavior of the teacher during the use of the laptop computer in the classroom.
    - In one of the technology-focused second grade classrooms, the teacher spent most of her time going from computer to computer touching the trackpad to solve problems for students. By the end of the year, the students would be sitting with their laptops, raising their hand, and waiting for the teacher to come solve a problem.
    - When the same computers were used in the curriculum-focused second grade classroom, the teacher moved around the classroom observing student work. In

many cases, the students took the initiative to solve their own computer problems and helped each other whenever possible.

Teacher Reflections:

- One teacher reflected on her expectations for the project by stating she "thought it was going to be a disaster." She went on to explain that she was having problems with the laptop computer and she could not imagine how her students who can barely hold a pencil would be able to use the laptop computer. "Handling a student a thousand dollar laptop was just one of the stupidest things you could think of." However, she was amazed to see the excitement of the students and how they all wanted to do well. In the end, she noted that the students did not have any problems with the laptops, and they were totally engaged in lessons.
- Other teachers reflected about how their experience caused them to think differently about lessons and projects for the classroom. After learning something new, they began to think about how they could teach it differently to engage the students in the lesson. One teacher reflected on how easy it was to integrate the technology into a lesson; she had not realized it was so simple. It has now become a "habit for her to think about using the technology in a lesson.

Two fourth grade teachers interviewed their students about using the laptop computers.

- In one classroom (that had focused on the curriculum), the teacher specifically asked the students about using the laptop computer. The students acknowledged the question, then began to discuss their projects, never mentioning the technology.
- In the technology-focused classroom, the teacher asked similar questions of the students and inquired about their frustrations with the technology. The students discussed specific software, such as iMovie and Inspiration. It was during this reflection process that the teacher realized the students were concentrating on the technology, and not the projects or curriculum.

The data collected from the study was published in the form of CD-ROM/website for the state of Florida called "No Strings Attached! Wireless Technology in Education". The videos and student artifacts guided the design of the website that was designed to share methods and ideas for integrating technology in the classroom. http://etc.usf.edu/wireless/default.htm

URL

For complete report findings:
https://center.uoregon.edu/ISTE/NECC2004/handout_files_live/KEY_253975/authentic.pdf

Keywords:
authentic instruction, Title I, elementary

Study
Laptop Learning: A comparison of teaching and learning in upper elementary classrooms equipped with shared carts of laptops and permanent 1:1 laptops, 2002-2003, Andover, Massachusetts

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Description/Research Question(s)/Major Finding(s)
South Elementary School, located in Andover, Massachusetts, is an affluent suburb located 20 miles north of Boston. During the 2000-2001 school year, the district provided the school with a cart of 30 laptop computers which was shared among all fourth and fifth grade classrooms. To increase the time teachers were able to use the laptops, the cart was brought into each classroom for a one-week period. In addition, all teachers met once a week with a technology resource teacher to learn how to use the laptops, troubleshoot problems, and integrate technology into their curriculum. That year, the principal conducted an experiment in which one classroom was allowed to keep the laptops for a longer period of time. During this time period, a notable increase in technology use was observed.

The study focused on comparing differences in instructional practices and learning activities experienced by students in classrooms that were permanently equipped with laptops and those that shared a cart of laptops. In total, 209 students located in nine classrooms participated in the study. Four of the classrooms participated in a parent purchase program and five shared a cart of laptops.

To document instructional practices and learning activities in the two settings, four types of data were collected. 56 classroom observations were conducted. During the observations, students' engagement level, the number of students working with technology, the number of students working independently, in pairs, in small groups, or in large groups and the role of the teacher was recorded every ten minutes via an observational checklist. In addition, observers recorded narrative accounts of the activities occurring throughout the one hour observation period, with a specific emphasis on teacher-student interactions, uses of technology, and student engagement. At the end of each observation, a detailed summary of the observation was also produced.

Teachers were interviewed using a semi-structured interview protocol that focused on several issues related to the use of technology in his/her classroom. All students also completed a survey that focused on students' specific uses of technology in school and at home, their teacher's use of technology in the classroom, as well as demographic information. Finally, to provide further insight into students' writing processes, students responded to the following drawing prompt: "Think about the work you do in your classroom. In the space below, draw a picture of yourself writing in school."

Findings:

1. Technology was used more frequently in 1:1 classrooms. On average, observers recorded an event that involved technology 33 times per observation when in the 1:1 classrooms. In contrast, events involving technology were recorded fewer than five times per observation, on average, in the shared classrooms.
2. Motivation and engagement was higher in the 1:1 classrooms. On a scale that ranged from 1 (no engagement) to 5 (high engagement), mean level of engagement for students in the 1:1 classrooms was 3.8 as compared to 3.3 in the shared classroom, a difference that is statistically significant at the .05 level ($t=4.72$, $df=257$, $p<0.001$).
3. Computers were the students' primary writing tool in the 1:1 classrooms. Classroom observations, student drawings, and teacher interview all provide evidence that students in the 1:1 classrooms viewed laptop computers as their primary writing tool. In addition, analysis of observation data, student survey data, and teacher interview data provide evidence that the amount of time students spend writing was larger in the 1:1 classrooms as compared to the shared laptop classrooms.
4. Classroom structure differed between the 1:1 and shared classrooms. Instances of teacher led whole class discussion were observed more frequently in the shared classrooms than in the 1:1 classrooms. Students in 1:1 classrooms were observed peer conferencing nearly two times more frequently than students in the shared classrooms. Two of the three 1:1 classroom teachers reported that they were more able to individualize instruction with full access to technology. In teacher interview, each of the 1:1 classroom teachers included comments about how 1:1 technology allowed students to learn more independently, cooperatively, and collaboratively than through traditional instruction.

URL

For complete report findings:
http://center.uoregon.edu/ISTE/NECC2004/handout_files_live/KEY_203576/LaptopLearning_final.pdf and http://escholarship.bc.edu/cgi/viewcontent.cgi?article=1000&context=intasc

Keywords:
Upper elementary, 1:1 vs. shared

Study
Laptop Requirement Usage and Impact in Graduate Information and Library Science Education

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Description/Research Question(s)/Major Finding(s)
In Fall semester, 2001, all incoming students to the graduate programs in the School of Information and Library Science in UNC-Chapel Hill were required to possess a laptop computer. This study examines the impact and utility of the laptop computers through the first 6 months of the laptop requirement. A combination of quantitative and qualitative data were collected, and evidence from secondary sources such as university reports and class syllabus materials were also gathered.

Research questions:

- How did different groups of people, i.e. new students, current students and faculty react and adjust to the laptop requirement?
- What were the factors that influenced the implementation of this requirement?
- What kind of concerns emerged, and what changes have happened or may happen in the School as the result of the laptop requirement?

An online survey was administered during the end of Fall 2001 semester to both first-semester students who entered the school with laptop requirement, and returning students with no such requirement. Email invitations were sent to internal mailing lists to solicit participants. An online Web-based form was used to collect survey responses. If they consented, participants also received a follow-up email with open-ended questions seeking clarification and amplification of their survey responses.

All data were stored and analyzed in MS Access and Excel. The quantitative survey replies were entered into the system and analyzed when received. For qualitative data, since we were examining participants within their social settings, and attempting to understand the phenomena through accessing the meanings participants have assigned to them, an inductive thematic coding scheme was developed (Flick, 1998; Orlikowski & Baroudi, 1991).

All participants in the study owned some kinds of computers. The ownership rate for desktop computers was quite high among participants. Over three-fourth of first-semester participants had their desktops prior coming to SILS, and some were upset because they had to buy another computer to meet the School's requirement.

First-year students who just started in SILS reported lower computer skills than returning students, which is not surprising. First-year participants who bought non-CCI laptops, however, reported higher computer skills than participants who purchased university-recommended computers. Buying a non-standard computer may imply that one has the knowledge to compare different laptop models and order it to match the School's requirement or one's personal preferences. It can also imply that one has the confidence to configure the computers to School

systems and rely on sources other than the university for help. If one is not quite confident about his/her computer skills, a CCI laptop with four-year warranty and convenient on-campus support can be a good option.

Students with CCI laptops showed a slightly different preference for help channels. Support from ATN was high on the lists of students with CCI laptops, but absent from the top list of students with non-CCI laptops. While students with CCI laptops enjoyed the convenience of help resources around them, students with non-standard computers were comparatively more self-sufficient, relying more on printed or online resources and people from outside school for help. Seeking help from laptop manufacturers was also preferred in this group.

Providing adequate technical support is one of the biggest challenges for universities with laptop programs. However, if more understanding is gained about students' preferences of support, this job can be done in a more efficient way. For instance, our data suggest that more accessible and useful materials can be provided to students, and easy communication channels among students can be encouraged.

Although laptop use was not widespread, especially in the classroom, participants were able to point out some benefits of using laptops. Besides alleviating crowdedness in the School's computer lab, personal laptop ownership could help students learn more about technology. This echoed one of the points made earlier: laptop programs benefit low-tech students most.

To students, what they did with laptops was not much different from what they usually did with desktop computers. Students' previous knowledge of and experiences using desktop computers influenced their encounter with laptops, and to some extent constrained their options in utilizing this new tool.

Incorporating laptops in classroom learning was not welcomed indisputably by all students. Rather, it was seen as both a threat and a benefit to learning experiences by participants. Distraction was one of the imperfections of having laptops in class.

URL

For complete report findings: http://www.petascale.org/papers/laptop-ASIST-2002-final.pdf

Keywords:

Student attitudes, tech support

Study
Laptop Use By Seventh Grade Students with Disabilities: Perceptions of Special Education Teachers, Maine Learning Technology Initiative Research Report #2

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Description/Research Question(s)/Major Finding(s)
The Maine Learning Technology Initiative (MLTI) provided laptop computers to all seventh grade students and their teachers in Maine and included professional development for teachers and wireless networks for every school building. In May of 2003, late in the first year of state-wide implementation of the MLTI, a survey was mailed to all middle school special education teachers (N = 749) to gather information about their use of the laptops and their perceptions of the use of laptops by their special education students.

Two hundred and ninety-three surveys were returned (39%).

The laptops were credited with improving the engagement of students with disabilities with their school work; increasing their motivation and ability to work independently; and improving their class participation, interaction with other students, interaction with teachers, and class preparation.

Special education teachers and parents indicated that the laptops also increased students' personal organization. Assignments and student work were more frequently organized in "folders" on the "desktop" of their laptop computers. Material was more easily organized by subject area and electronically filed.

Another important finding of this study was that special education teachers perceived their special education students to have increased the quality and quantity of their writing. For many of these students, the laptops removed the motor coordination challenge of writing with pen and pencil and allowed them to produce work that was easily edited and looked as good as the work of their non-disabled peers.

The laptops were perceived to be of clear benefit to the majority of students with disabilities who were taught by special education teachers responding to the survey. However, there were a few exceptions. Students who were highly distractible, blind and partially sighted students, and highly anxious students with low tolerance for frustration were all described as students who could not benefit from the use of laptops.

Another finding of the study was that the general nature of a student's disability did not determine whether or not a laptop would be perceived as an effective instructional tool. Most special education teachers described how the laptop computer was of benefit to highly distractible students, while a few described the laptop as yet another distraction. Most students

with disabilities were highly motivated by their laptops, while a few were frustrated by minor glitches with the technology and avoided use of the laptop.

URL
For complete report findings:
http://www.usm.maine.edu/cepare/pdf/mlti/MLTI%20Phase%20One%20Evaluation%20Report%202.pdf

Keywords:
Learning Disabilities, student attitudes, student behavior

Study
Learning With Technology: The Impact of Laptop Use on Student Achievement
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Author (s)
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Description/Research Question(s)/Major Finding(s)
Harvest Park Middle School, located in Pleasanton Unified School District in Pleasanton, California, established its Laptop Immersion Program in 2001. Located 40 miles southeast of San Francisco, in the center of what is rapidly becoming the new "Silicon Valley," suburban Pleasanton has experienced considerable growth in its residential and business base over the last two decades and is now home to an increasingly diverse population of more than 60,000. A highly educated, high-income community has developed in the midst of what not too long ago were acres of fruit orchards and cattle fields on the edge of Alameda County. As a school experiencing rapid growth over a short period of time, the challenge of Harvest Park was to maintain the same high level of academic excellence, while building an infrastructure that would meet the demands of its student population. Harvest Park's laptop program emerged out of a partnership between the offerings of the high-tech businesses in the community and schools' search for innovative programs.

Students in the Laptop Immersion Program receive the same grade level curriculum offered to all students in the district. The differences are seen in the method of curriculum delivery and in the latitude of options students are given to demonstrate curriculum mastery through the use of technology. All students are eligible to participate in the program. Parents purchase the laptops used by their students in this program. For families who cannot afford to purchase a laptop, a Laptop Advisory Committee, comprised of an administrator, and teacher and parent representatives, reviews parent requests for loaner laptops. The loaner applications are reviewed during the spring enrollment period for the program. To date, no student has been denied an opportunity to participate in the Laptop Program. The loaner program provides students computers approximately one week before the start of the school year and allows students to keep them until the end of the school year. At the end of the year, students in the loaner program are required to return their computers to the school.

The study presented here examined the impact of participation in a laptop program on student achievement. A total of 259 middle school students were followed via cohorts. The data collection measures included students' over-all cumulative grade point averages (GPAs), end-of-course grades, writing test scores, and state-mandated norm- and criterion-referenced standardized test scores. The baseline data for all measures showed that there was no statistically significant difference in English language arts, mathematics, writing, and overall grade point average achievement between laptop and non-laptop students prior to enrollment in the program. However, laptop students showed significantly higher achievement in nearly all measures after one year in the program. Cross-sectional analyses in Year 2 and Year 3 concurred with the results from the Year 1. Longitudinal analysis also proved to be an independent verification of the substantial impact of laptop use on student learning outcomes.

The study presented in this article examines the impact of the Harvest Park Middle School's laptop immersion program on student learning. Specific research questions include the following:

- Does the laptop program have an impact on students’ grade point average?
- Does the laptop program have an impact on students’ end-of-course grades?
- Does the laptop program have an impact on students’ essay writing skills?
- Does the laptop program have an impact on students’ standardized test scores?

To compare the demographics of students enrolled in the Laptop Pro-gram to the demographics of students school-wide at Harvest Park Middle School, several key indicators were identified. These key demographics data included students’ ethnic background, gender, Gifted and Talented (GATE) program enrollment, special education status, enrollment in the National School Lunch Program (NSLP; economically disadvantaged status), English Learner status, and parent education level.

All demographic indicators show no more than five percentage points difference between laptop and non-laptop students. This indicates the demographic composition of students enrolled in the program closely mirror those of the entire school population.

Although students were not randomly assigned to participate in the laptop immersion program, an examination of indicators of achievement indicate that students who participated in the program and those that did not participate performed similarly prior to start of the laptop program. Analyses of outcome measures collected after participation in the laptop program, however, indicate that students who did participate in the program tended to earn significantly higher test scores and grades for writing, English-language arts, mathematics, and overall Grade Point Averages (GPAs).

Due to the small sample size, this study did not analyze the data for special education students. However, laptop use with special education students certainly seems to be a promising classroom-instruction strategy and an avenue for future research. Laptop computers offer students with disabilities an opportunity for success that may not be otherwise offered. Laptops provide special education students an additional visual represen-tation of learning material, which directly addresses the needs of these students. As evidenced by Goldberg, Russell and Cook (2003), the effect of computers on student writing had the strongest positive impact on stu-dents with disabilities.

One limitation that might have a confounding effect on student achievement in this study is the teacher assignment into the Laptop Pro-gram. Participating teachers volunteer for the program. As with most field-based research in education, in the absence of random assignment into the program, the differences in student performance may be partly because of differences in teachers volunteering for this program.

URL
Complete report findings: http://www.bc.edu/research/intasc/jtla/journal/pdf/v3n2_jtla.pdf

Keywords:
Student achievement

Study
Lessons Learned About Providing Laptops for All Students
A product of the Northeast and the Islands Regional Technology in Education Consortium (NEIRTEC)

Author (s)
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Description/Research Question(s)/Major Finding(s)

Although one-to-one programs vary from one another, they have each demonstrated that a comprehensive, systemic approach is needed if the initiative is to achieve the desired goals. No one component is sufficient for a successful initiative. "If it's not going well," says Bette Manchester, "it's usually about the leadership. There needs to be a leadership team that looks at things through three different lenses: the lens of curriculum and content; the lens of the culture of the building; and the lens of technical needs."

As a way of helping states and districts interested in laptop initiatives, NEIRTEC has reviewed lessons learned to date from many laptop initiatives around the country. Recommendations:

1. Build a strong leadership team at all levels

   Strong leadership is needed at all levels, from the classroom and the school to the district and the state. For example, Indiana's experience shows that strong and visionary leadership that encourages collaboration and risk-taking is needed from teachers, as well as from administrators. According to preliminary results of an evaluation, "the ongoing success of one-to-one in Indiana is dependent upon the support and involvement of building-level leaders" (Lemke & Martin, 2004). Similarly, Bette Manchester believes that, "You really need to spread the leadership for a project. And giving teachers a lot of say and responsibility for how this project is played out is really critical" (Manchester, 2004).

   <u>Meet on a regular basis</u>: In Maine, school leadership teams (including the principal, a teacher leader, the technology coordinator, and the librarian) meet on a regular basis to assure that all aspects of the laptop program are moving at a similar pace, including the technical infrastructure, professional development, software needs, etc. Technical needs alone ought not drive the initiative; instead, "the educators in the building need to own the technology work" (Manchester, 2004).

2. Think about funding for the long term

   Ongoing training and technical support are costly and require a long term commitment from the operating budget. Most of the initiatives reviewed for this document faced unexpected costs due to technical difficulties (such as inadequate network bandwidth), and personnel often requiring more training than was planned. Successful programs use multiple sources of funding, including appropriate state and federal programs.

3. Develop solid partnerships both inside and outside the school system

   <u>Take into account stakeholders' level of interest in the one-to-one initiative and demonstrate success early</u>: Stakeholders' initial perceptions of technology influence their predisposition to carry out an initiative like one-to-one computing, and they can either facilitate or hinder the

implementation process. Therefore, in large systems it may be best to begin with volunteer districts or schools, as many states are doing, rather than the entire system.

Business partners, including hardware and software vendors, can help reduce costs and build a more effective team.

Develop partnerships with evaluators: Maine began at an early stage to use university-based teams of evaluators who could quickly provide the legislature with information it wanted about implementation of the laptop program

4. Plan logistical details carefully

   Help protect the computers: Once laptops arrive, they need to be stored in a secure place that is accessible on a daily basis, especially in case students are not allowed or choose not to take their laptops home. To transport the computers safely, a well-cushioned carrying case will help prevent damage. Similarly, to reduce students' intentional or unintentional misuse of laptops, it is important to develop and establish a code of conduct that specifies the rights and responsibilities of students with regard to the care and use of laptops (Apple, Profiles in Success: Henrico).

   Set up filters and other control mechanisms for laptops: Henrico staff added controls to limit what students could access at school and reconfigured the laptops to limit file sharing and downloading of inappropriate materials

   Design systems for distribution and for daily management: Prior to distributing the laptops, inform students and parents about the code of conduct through a seminar, workshop, or in other ways. Require students and teachers to sign the acceptable use policy for proper use and care of laptops. Create an inventory; Henrico for example, scans barcodes to ensure an accurate and efficient inventory. Collect insurance payments and forms. Establish a Help Desk (telephone-based, or other) for troubleshooting and technical questions, so students know where to turn if they experience problems (Edwards, 2003). It is also essential to have a system in place to manage the daily use and distribution of the laptops.

Training & Professional Development

1. Provide training and professional development for teachers and administrators mainly on curriculum integration, not only on technical skills

   Assess the technical and professional development needs of school staff: Effective training builds upon existing knowledge. Knowing at an early stage the different technical proficiencies that teachers and administrators have can help you develop a professional development plan that is sustained, rigorous, and effective in addressing their needs.

   Form a "Technology Leadership Team": From the onset, administrators at Gillispie School in La Jolla recognized that "the laptop initiative would succeed only if all teachers received ongoing professional development" (Apple, Profiles in Success: Gillispie). They therefore formed a "Technology Leadership Team," which trained teachers new to classroom technology integration and provided ongoing training and mentoring to teachers at all levels and specialties. Similarly, Dan Evans, former State Superintendent of Indiana advises new initiatives to "put together a team that brings together expertise in curriculum, learning, school change, and technology.

Use a variety of training and professional development formats: Teachers value both formal professional development events, such as workshops during the school year or summer, and informal opportunities to learn from their colleagues. Team meetings, department meetings, and other ongoing events can become occasions to discuss technology integration. Co-teaching opportunities can be useful, as well as demonstration lessons taught by more expert teachers. Online professional development is a viable option, especially because all the teachers have laptops.

Partner with local universities, education organizations, and other institutions: Explore whether local universities and/or education organizations have the expertise and capacity to assist in training teachers, administrators, and others.

Provide administrator professional development: Training is often planned for teachers while leaving administrators aside. However, administrators play a leading role during implementation and they also need guidance, advice, and training. Indiana, for instance, collaborated with Apple to organize seminars like “Problems Encountered with Teachers Integrating Technology” to help administrators improve their leadership skills

Make professional development flexible: As teachers and administrators receive training, their needs change. Therefore, it is critical to keep updating professional development.

2. Train parents on basic technical skills and inform them about the code of conduct and rules involved

   Establish a training requirement for parents: From the outset, Maine has expected parents to attend a 90-minute training before the laptops are allowed to go home. Similarly, in Henrico County, parents of every middle school student are now required to attend a 90-minute training session before picking up the laptops. These sessions provide technical information about the machines as well as an explanation of the code of conduct established for the use and care of laptops.

   Create parent resource centers: Recognizing that a one-to-one computing initiative can reach out to parents and families, Henrico used Parent Resource Centers to make training available for parents interested in acquiring basic technical skills and conducting Internet research.

   Purchase or license digital materials: In order for teachers to integrate technology in the curriculum, and for students to use technology, they need access to the necessary software, online databases, and proprietary websites. Schools and districts should not only take care of licensing procedures to make the necessary tools available to teachers but should also provide sufficient guidance or training on how to use the tools.

   Create e-learning curriculum writing teams: Many laptop initiatives provide opportunities for their teachers, often working in teams, to develop lesson plans, websites, online courses, electronic documents, and other curriculum resources.

   Identify software needs and restrictions:

3. Build and maintain the necessary network infrastructure

   Assess the infrastructure and wiring needs within the school: The school may require network infrastructure modifications, which are costly and take time. If these issues are addressed at the onset, significant time and trouble may be saved later.

Support and maintain networks: Setting up the necessary infrastructure is not sufficient, it is also necessary to maintain it. The experience in Indiana showed that infrastructure needs to be “well supported by onsite technical support personnel” in order to keep network capabilities in good condition and up-to-date (Lemke & Martin, 2004).

Consider purchasing display devices: Students and teachers will sometimes want to be able to look at a single screen as a group. In Henrico County, each classroom has a display device. Alternatively, classrooms may share display devices.

4. Make technology support available onsite as well as offsite

   Have onsite technical assistance available: Teachers across programs often mention the lack of sufficient onsite technical support. “If teachers new to computers cannot get the help they need when problems arise in the middle of a lesson, they will become soured to future technology use”

   Establish clear procedures to address major technical needs offsite: Some technical needs and repairs require specialized offsite services. Developing clear procedures for shipping and repairing laptops offsite as well as maintaining a strong partnership with offsite institutions can help reduce delays and make this process more efficient.

   Create a “student-run” help desk: Henrico was a pioneer in establishing a help desk composed of tech savvy students who, under the supervision of a faculty member, provide help to students and teachers who encounter technical problems during the school day. Students take turns working at the help desk and earn community service points for their efforts.

Managing Change

1. Allow sufficient time for change and make it gradual

   Allow time for teachers to become comfortable with technology before expecting them to use it for instruction: In Maine, it proved essential to allow teachers sufficient time to become familiar with the laptops before expecting them to be used in classrooms. Similarly, after rapidly implementing the one-to-one program at the high school level, Henrico realized that allowing teachers, administrators, and other stakeholders sufficient time between the planning stage and the distribution of laptops to students is important for successful implementation. Thus, middle schools teachers received their laptops a full year before the students, and that time provided the teachers with a high degree of confidence in their ability to use the laptops (Edwards, 2004).

   Provide students with keyboarding skills: Technology integration may become “much more seamless” when students are given sufficient time pre-launch to become familiar with basic computer skills, like keyboarding, as highlighted by the experience at Gillispie School (Apple, Profiles in Success: Gillispie).

   Expect change to be gradual: In large laptop initiatives, like Maine’s, students at different grade levels usually receive laptops in different years. Over the long term, as computers are used more routinely, changes may take place not only in instruction but also in assessment systems (e.g., online testing), instructional materials (e.g., closer ties between textbooks and digital materials, including software), management systems (including data-driven decision-making), and communications with parents.

2. Foster and maintain stakeholder participation and ongoing communication

   Use various approaches to reach out to the broad community: All Maine schools held parent nights at an early stage of the laptop program, and most continue to hold annual parent nights. Henrico County created a "key communicator network" through which 400 stakeholders communicate via e-mail to learn about accomplishments and address challenges.

Monitoring & Evaluation

1. Make monitoring ongoing
2. Conduct research or evaluation studies

   Look for critical influences at multiple levels of the education system: There are many influences on teachers' and students' uses of technology. Study those influences that are most important in your context (state or district policies, school leadership, demographics of schools, teachers' training and expertise, etc.). Don't try to do it all.

   Figure out what you're especially trying to teach, and measure that: If you study student achievement, focus on areas that are high priorities in the laptop program. Even then, the evaluation field is likely to require the development of more good assessments of student learning—for example, to measure students' higher order thinking, problem solving, and technology

   Look for ways to evaluate the long-term costs and benefits of the technology infrastructure: Both costs and benefits are difficult to quantify, but understanding them is important. Little has been written about the costs of laptop programs, and about the relationship of those costs to the benefits.

   Let the research question drive the choice of method: There are too many interesting questions to ask about laptop programs for you to study them all. Depending on the research questions you choose, surveys, case studies, experiments, or other methods may be appropriate. No one methodology is best for answering all questions.

URL
For complete report findings: http://www.neirtec.org/laptop/LaptopLessonsRprt.pdf

Keywords:
Leadership, Professional Development, Planning, Infrastructure, Parents, Business Partnerships, University Partnerships

Study
Let my laptop lead the way: A Middle Eastern Study

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Description/Research Question(s)/Major Finding(s)
This paper describes the experiences of both students and faculty in two tertiary institutions in the Middle East: a university for women and a vocational college for men. Both of these institutions have recently made it mandatory for students to purchase a laptop computer.

In the UAE, as in most Gulf States, tertiary education for citizens is supported by the government. Each of the last three decades has seen a major governmental investment in the creation of an institution of higher education. In 1977, with the opening of the UAE University, it became possible for the first time for a UAE citizen to complete his or her full education within the country's borders.

As His Excellency Sheikh Zayed, the President of The UAE, has said, “Youth is the real wealth of the nation” (ArabNet, 1996), and this is the reflection of the Islamic belief that education and individual pursuit of knowledge are prerequisites of a successful society. The culture and religion of the UAE play a vital role in the personal, familial and social structure of its people. Thus, a conceptual framework encompassing Islamic religious values and Western career education components is not as surprising as many might think.

This paper explores the four major factors to consider when introducing new technological innovations into the curriculum. These are: (1) culture, (2) gender, (3) infrastructure and support, and (4) faculty. If any of these four are ignored, the introduction of technology is likely to be complicated.

Gender differences
In accordance with Islamic teaching, education is only co-educational at the kindergarten level (Al-Adhab, 1992). Hence, the majority of students in the institutions in this study had never been taught by a teacher of the opposite sex. Gender differences were observed in this study. Male students expected the new technology to offer them quick and easy answers and were quick to help each other in a predominately individual or preferred-pair work approach. Girls were more interested in how they could reach a high quality final product through interactive group work.

Cultural factors
The UAE is a fast developing modern country with the latest technological benefits of the modern age at every corner. Nevertheless, the culture of the UAE is rooted in the tradition and heritage of their Bedouin forefathers and their deeply held Islamic beliefs. These factors play a large role in the daily life of the modern Emirati student and, in the opinions of the students themselves, enhance their openness to new ways of learning. The secondary schooling system remains very traditional with teacher-led classes. Secondary education emphasises rote learning and memorisation. Therefore, despite great progress in the last few years, many tertiary students

enter university and college with a need for improved critical thinking skills (Daniel, 2001). The introduction of laptops has accelerated this development as it creates a new learning paradigm based on more student responsibility and more emphasis on research skills and project work supported by alternative modes of assessment. In the beginning, students struggled as they were guided how to find answers to their own questions rather than being provided with an all-knowing teacher.

Infrastructure and Support
At the women's university, Information Support installed over a thousand network sockets in a very short period of time to produce a truly enviable technology-rich learning environment. Later, faculty expressed concern about the restrictions of free movement in the classrooms caused by the positioning of the sockets and the pedagogical problems this caused. In the male vocational college, which is currently in the process of moving to wireless technology, the faculty were frustrated by technical difficulties. Hours were spent preparing classes which then might be scrapped as servers failed or laptops crashed. Customary technical faults became major concerns and have led to plans for a significant increase of bandwidth and server strength. Clearly, such technical considerations play a major role in the success or failure of the technology-rich learning environment.

Faculty Affective Factors
The faculty affective factors were seen by all concerned as the most important factor of the four, because they believed that if they were not considered, the planning required would be faulty. The authors noticed that the introduction did, as stated above, involve the movement of the curriculum into a new learning paradigm that placed more responsibility on the students. This shift requires a similar shift in the teaching and learning approaches followed by the faculty. Such a change is never easy to manage and must be carefully planned.

Conclusions
Whilst the cultural factors may not affect the programme greatly, it is believed that planners should be aware of these factors. The experiences gleaned from this study support the view that computer-based study is more effective when delivered to single-sex classes in this cultural setting. It is suggested that a clear infrastructure and strong institutional support is required to ease the extra faculty workload brought about by the implementation of laptops and the concomitant shift in learning paradigm. Finally, planners must take into consideration the faculty affective factors if any such program is to be introduced successfully.

URL
For complete report findings: http://ifets.ieee.org/periodical/vol_1_2002/saunders.html

Keywords:
Gender differences, cultural factors, infrastructure and support, faculty affect, United Arab Emigrates

Study
Liverpool Central School District Evaluation Report, Year 2, High School Laptop Computer Program, 2001-2002

Author (s)
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Description/Research Question(s)/Major Finding(s)
During school year 2001-2002 the Liverpool Central School District continued its high school Laptop Project. As was the case the previous year, students in the tenth grade at the high school could elect to participate in the program through the lease/purchase of a laptop computer. Those students who were now eleventh graders in 2001/2002 could elect to continue in their second year of the program. Further, eleventh graders who had not participated the first year could enroll as first time participants. The students' laptop computers were intended to provide a new and exciting tool for learning and teaching.

The Liverpool Central School District, through this project, sought to pioneer an innovative initiative using laptop computers and related technology to a) expand and enhance learning opportunities; b) improve student achievement, creativity, and motivation; c) seamlessly integrate advanced computer technology into classroom instruction and learning at home; d) better prepare students for a lifetime of success in a technology-rich world, and with the continuation of the external evaluation, e) determine the longitudinal impact of the program on learning and teaching.

To evaluate Year 2 of the program, the external evaluator accomplished the following, a) developed a questionnaire to be administered to both first and second year student participants at the end of the 2001/2002 school year; b) developed a questionnaire to be used with student non-participants; c) developed Year 2 questionnaires for parents and teachers; d) analyzed questionnaire data during the summer of 2002; e) gathered observational data through two on-site visits to the high schools during the spring of 2002; and f) analyzed academic outcome data and student attendance and behavior data provided by the district regarding participating and non-participating laptop program students.

The end-of-the-year 2001/2002 assessment instruments were designed to determine student, parent, and teacher perceptions of the following: a) how students used computers, b) what impact the Laptop Program had on academic achievement, c) the impact the Laptop Program had on the human dimensions of the classroom including student attendance and behavior, d) concerns about using a computer, e) what purpose computers best served in a classroom, and f) how responses varied from year to year, grade to grade, and group to group.

Approximately 678 students, 241 parents, and 33 teachers participating in the laptop program completed the 2001/2002 survey instrument. Approximately 259 non-participating students and 47 non-participating parents also responded to the end-of-the-year questionnaire.

Conclusions after data analysis:

1. The type of experience a laptop student had in Year 2 was more dependent upon the individual teachers the child was assigned than the subject taken, or even the grade level of that child. It appeared that the more experience and enthusiasm the teacher had for the Program, the better the experience was for the student.
2. Continued efforts must be made to increase teacher comfort with using technology associated with the Laptop Program. This can be done best by continuing staff development, rewards for teachers who exhibit growth and/or expertise in use of technology in teaching, and reaffirming at the highest level that teachers are expected to regularly use the laptops in their classrooms – and students are expected to bring their machines to class regularly, just as they would be expected to bring a textbook.
3. It became obvious in Year 2 that even one year of teacher experience with laptop technology makes a significant difference in how smoothly the Program operates, how positively parents and students view the Program, and how many "concerns" are expressed. The more actual classroom experience a teacher has with the laptops, the more likely that teacher will not only use the laptops regularly, but instill in students and their parents a belief in the efficacy of the Program.
4. Students, teachers, and parents in the Laptop Program in Year 2 often responded negatively to the durability of the laptops. Since computers will continue to break down and malfunction for the foreseeable future, and since it is very important for students to have their laptops in class every day and every period possible, it is imperative that the district maintain its technology support component.
5. There is a small group of parents whose children are not participating in the Laptop Program that has a strong belief that the Program is unfair – unfair in the sense that participation is at least partially subject to a family's ability and/or desire to pay, and pay beyond what has traditionally been considered a school expense as opposed to a family expense. In the interests of fairness to students, the district must continue its search to secure a funding source that allows all students to participate in the program, regardless of their parents' ability (or willingness) to pay.
6. While the evaluator is reluctant to suggest that a definite and positive causal relationship exists between laptop use and student outcome measures, the initial analysis indicates that there is a difference in performance between those who do and do not have laptops. The initial findings are significant enough that the evaluator does strongly believe that review of outcome data needs to continue to be an important part of assessing the Laptop Program over time. The evaluator further concludes that longitudinal analysis is critical since variations in performance may be cumulative.
7. The growing negative responses of eleventh grade student participants and their parents in year 2, along with weak support of the Program among teachers completing their first year of the project, is worrisome. If this negativity continues to grow beyond these three groups, the Program will have great difficulty succeeding. On the other hand, teachers who now had gained two years of experience with laptops in classrooms were generally very positive about the Program, as were the Year 2 tenth grade student participants.
8. Despite the "growing pains" of implementing such a large and complex initiative, the Laptop Program in this District has certainly shown that under the right circumstances, laptops can be a wonderful and exciting tool for teaching and learning. The evaluator did observe in every basic subject at least some teachers and their students engaged in laptop lessons that were so interesting and thought-provoking that the evaluator hated to leave

the class to continue his observations. Further, on multiple occasions, individual teachers related to the evaluator how their participation in the Laptop Program has rejuvenated them as both teachers and learners. The evaluator has no doubt, based on his observations and discussions with teachers and students, that in this District laptops can (in fact in some cases already has) enhance learning and teaching. The question is, "Will a large enough core of teachers come to this same conclusion – and do so soon enough that the program will endure?" Adult learning theory tells us that we each develop and progress at different rates, and we change at different points in time. That appears to be what is happening now at the high school – different teachers are gaining comfort with the new technology at different rates and at different levels. Sufficient time is needed for a larger and substantial core of teachers at the high school to become comfortable with teaching using laptops – and with teaching using technology in general.

9. The District needs to make a concerted effort to keep parents and the community informed throughout each school year about how, where, and when laptops are being used in instruction. This will do two things. First, it will bring attention to the many exciting things that are actually occurring in classrooms related to the Laptop Program – activities and uses that the greater community may not otherwise be aware of without the District bringing it to the attention of parents and others. Second, by committing to regularly announcing laptop activities throughout the year, everyone directly associated with the Program will have a constant reminder that level of laptop use is important and is being monitored.

URL

For Complete Report Findings:
http://www.liverpool.k12.ny.us/Laptops/LaptopEvalFinalYr2.pdf

Keywords:
high school, student achievement, attendance, behavior

Study
Powerful Tools for Schooling: Second Year Study of the Laptop Program, 1998

A Project for Anytime Anywhere Learning by Microsoft Corporation
Notebooks for Schools by Toshiba America Information Systems

Author (s)
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Description/Research Question(s)/Major Finding(s)
In the Fall of 1996, Microsoft Corporation and Toshiba America Information Systems began a Laptop Pilot Program at 29 "pioneer" school sites across the United States. Participating students acquired and regularly used Toshiba notebook computers loaded with Microsoft Windows and Microsoft Office software. The pilot program was designed to demonstrate that providing every student within a classroom with access to "real world" business tools would produce substantial educational benefits by supporting learning anytime and anywhere.

ROCKMAN ET AL, an independent research organization in San Francisco, CA, was contracted to explore and assess the laptop program implementations. The early experiences of the participating schools are detailed in the June, 1997 "Report of a Laptop Program Pilot," available on the web sites of Microsoft, Toshiba and ROCKMAN ET AL.

During the 1997-1998 school year, ROCKMAN ET AL tracked the experiences of teachers and students at selected pioneer schools during their second year of the Laptop Program. In these programs, participating students have full-time access to notebook computers both in school and at home. The second year study explores when and how the computers are used, their impact on teaching and learning, and participants' assessments of their experiences in the program. Our findings point to significant learning and student and teacher accomplishments in skill development, applications of technology for schoolwork, and improved critical thinking.

The second year study gathered information from both middle and high schools through a series of processes and instruments that were designed to support and validate each other. These approaches include:

- Teacher survey on classroom implementation, completed by 144 teachers;
- Student surveys on technology skills and learning strategies, completed by more than 450 students, including a comparison group of Non-Laptop students;
- Shadow studies of and interviews with students and teachers in the 7th and 10th grades, conducted over several days, which captured data for 48 student days and 12 teacher days, and included a comparison group of Non-Laptop students;
- Comprehensive student data from simulated problem-solving tasks, administered to 23 small groups of Laptop students and 6 groups of Non-Laptop students in 7th and 10th grades; and
- Students' detailed descriptions of their favorite projects and activities, provided by more than 400 students, including a comparison group of Non-Laptop students.

Collectively, this is a complex and rich set of data. We found consistency in the outcomes of these multiple approaches which, in turn, increases our confidence in the findings we report and their implications.

Findings regarding student use of technology:

1. Laptop students spend more time using computers
2. Laptops appear to extend the school day
3. Laptops are frequently used in core subject area classes
4. Laptop students in public schools use the computer more often than private school Laptop students
5. Purposes of in-school laptop use vary by grade level and subject
6. Students choose tools appropriate to the task
7. Students and teachers make use of a subset of software
8. More computer use results in more proficient students

Findings regarding impacts on teaching and learning:

1. Laptop students spend more time engaged in collaborative work than Non-Laptop students
2. Laptop students participate in more project-based instruction
3. Laptop lead to more students writing and to writing of higher quality
4. Laptops increase access to information and improve research and analysis skills
5. Laptop students prepare more presentations than non-laptop students
6. Teachers and students take on different roles when students have laptops
    a. Teachers become facilitators
    b. Teachers spend less time lecturing
    c. Students become collaborators
    d. Students direct their own learning
    e. Laptop students report a greater reliance on active learning strategies
    f. Laptop students use computers to accomplish complex school tasks
    g. Laptop students readily engage in problem solving and critical thinking
        i. Identifying information needs
        ii. Locating information
        iii. Applying higher order thinking skills
    h. Teachers attribute students' critical thinking skills and problem-solving proficiency to their use of laptops
    i. Teachers believe laptops benefit students' learning in general, but significant, ways
        i. Quality of work
        ii. Interest in school
        iii. Learning/understanding content

Findings regarding teachers' and students' assessments of the program:

1. Teacher enthusiasm remains high
2. Teachers believe laptops benefit all types of students
3. Teachers name advantages of laptops over desktops or labs
4. Students enjoy using the computers

5. Students' favorite projects reflect laptops' positive impact

URL

For complete report findings: http://www.microsoft.com/education/download/aal/research2.rtf

Keywords:

middle school, high school, problem solving, technology use

Study
Promoting academic literacy with technology: successful laptop programs in K-12 schools, 2004

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Description/Research Question(s)/Major Finding(s)
This paper presents case studies of two K-12 schools that successfully employ high-technology environments, including laptop computers for each student, toward the development of English language learners' academic language proficiency and academic literacy. In the first school, Latino fourth-grade students use laptops and other new technologies for a wide variety of pre- and post-reading tasks as part of their effort to transition from learning to read to reading to learn. In the second school, diverse immigrant and refugee students at the middle school level combine technology use with Expeditionary Learning to carry out community projects leading to the development of sophisticated products.

The percentage of language minority students in US schools continues to grow, with nearly four million K-12 students receiving special instruction as English language learners (ELLs) (National Center for Educational Statistics, 2004). Many more non-native speakers of English graduate out of ESL programs to mainstream instruction, but have still not fully caught up with grade level instruction. Unfortunately, most language minority students never achieve academic success in the US, with great disparities between them and native English speakers in standardized test scores, graduation rates, college admission and completion rates, and adult wages (Noguera, 2001).

Virtually everyone who is born in the US or who immigrates to the country by the age of 12 becomes conversationally fluent (Greenberg et al., 2001). The major challenge that schools face vis-a`-vis ELLs is not conversational fluency but rather academic literacy. Academic literacy can be defined as the reading, writing, speaking, listening, and thinking skills, dispositions, and habits of mind that students need for academic success. It includes the ability to critically read and interpret a wide range of texts, to write competently in scholarly genres, and to engage in and contribute to sophisticated academic discussion (Intersegmental Committee of the Academic Senates, 2002). While English learners develop basic interpersonal communication skills within a year or two, it takes them much longer to develop the knowledge of complex vocabulary, syntax, and genres that underpin academic literacy (Cummins, 1988). The development of this broader academic language proficiency requires five to seven years of instruction with several key elements, including large amounts of extensive reading, focused linguistic analysis of texts, and involvement of students in motivating and cognitively engaging learning activities and projects (Cummins, 1989a,b).

The authors of this report used standard qualitative methods, including observations, interviews, and collection of artifacts, with an emphasis on digital documentation of best practices.
Adelante Elementary School

Adelante Elementary School is located in a low-income Latino community of California. Some 96% of the students in the school are Latino and 75% are designated as ELLs. As a grade 4–6 school, Adelante deals with students at a critical juncture for the development of academic literacy. Students in upper elementary school must go through a transition from learning to read, with a focus on decoding skills, to reading to learn, with a focus on comprehension of increasingly challenging expository texts across a number of content areas.

Mr. Molina was chosen by Adelante to teach their one-to-one laptop class based on his prior success in integrating technology into the reading and language arts curriculum. His class was selected for observation in this study as the one class at Adelante with one-to-one laptop computing. Technology skills are infused into each of the projects that Molina's students complete through thematic literature units. In Molina's class a SMART Board, Renaissance Learning Programs, the Internet, digital cameras, and computer programs such as SMART Ideas cognitive mapping software, Microsoft Word, Microsoft Excel, and Microsoft PowerPoint are used as media for projects where students interact with text. The goal of these projects is to refine the students' process of constructing rich meaning from text. Coupled with this wealth of technology are extensive opportunities for students to practice reading.

Observations at the school, as well as interviews with students and their parents, indicated an extraordinarily engaged group of students with a joyous attitude toward school, literacy, and learning. These results are of course not solely attributable to the laptop program or other use of technology. Rather, Molina and the school were able to make use of new technologies to build on their previously successful approach, which involved promotion of academic literacy through extensive reading, intensive attention to texts, and involvement in cognitively engaging projects.

Urbania Middle School

Urbania Middle School represents a different, but we feel equally effective, approach to using laptops to promote academic literacy. Urbania serves the most economically, academically, and linguistically diverse neighborhoods in the state of Maine. Among a population of 520 students in grades six through eight, approximately 24% of students are from immigrant or refugee families, speaking some 25 languages. The largest groups of ESL students come from Somalia and Sudan, with others from Afghanistan, Southeast Asia, the Middle East, Eastern Europe, and Latin America. Since the school serves as a major refugee relocation center, many of these students have little educational background in their own country prior to their arrival in the US. A majority of the native-English speaking white students at the school also face educational and social challenges, with some 70% of children in the surrounding neighborhoods coming from single-parent households and a nearly equal number living in poverty. Simply put, students who do not gain sufficient academic literacy skills by the completion of Middle School face so many challenges with increasingly difficult material that they often drop out.

Though Urbania has more English language learners than any other school in the state, its reading and writing test scores fall well above the state average. The educational reform at Urbania has developed in three stages. In the first stage, beginning in 1993, Urbania's principal and staff developed and implemented a Expeditionary Learning Outward Bound (ELOB) model (Expeditionary Learning Outward Bound, 2004), in which the main curriculum of the school is

organized around 8–12 week interdisciplinary projects. In the second stage, beginning gradually in the mid-to-late 1990s, efforts by the school's technology coordinator and classroom teachers helped make new media central to many of the ELOB projects, with students using computers, the Internet, and other digital media to carry out their inquiry and develop products. In the third stage, beginning in 2002, the school issued laptop computers to all students at the seventh grade and eighth grade levels, and one-to-one computing further supported the reform effort.

The principal and staff's relentless commitment to overcoming educational inequity, conflict, and division in the school has been key to the overall reform effort. Before the reform effort began, Urbania was characterized by low test scores, deteriorating attendance and discipline, few extracurricular activities, low expectations for teachers and students, and a climate of hostility. Today, students are no longer tracked, pullouts are reduced, and students are heterogeneously mixed in core subjects with the expectation that teachers would teach to all students. Teachers are encouraged and supported in developing and implementing thematic curriculum with effective middle level teaching practices. Related arts teachers, special education teachers, and reading specialists have been integrated into the teaching teams.

The Expeditionary Learning model focuses on the relationship between learning and representation. This methodology is supported by research indicating that student's best master curriculum that they are required to represent, and consequently, that learning is extended by one's access to, and literacy and facility with, representational media (see discussion in Zemelman et al., 1998). In the last weeks of a learning expedition at Urbania, students and teachers typically finalize the design of the expedition product, create multiple drafts of individual student contributions, and assemble the work of all students in a single culminating product. Prior to the development of multimedia resources, products (and the learning processes for developing them) were limited to non-digital, largely linear, and difficult-to-edit media. Use of color artwork was limited due to expense of reproduction. Moving images, sound, and interactive models were limited to performance-based products.

Working in a representation and media rich learning environment has important advantages for the diverse students, and especially ELLs. The incorporation of visual artwork allowed students to develop and display multimedia skills while they simultaneously develop their writing ability. The creation of a multi-tiered final product created opportunities for all students to do their best work while contributing to a collective product. When one views the final product, all of the work looks equivalent on the surface. The extra work, though immediately accessible through hyperlinks, lies beneath the surface and does not detract from the appearance of anyone else's work. Finally, students develop an ability to think critically about new media genres when they actually go through the process of producing new media rather than just consuming it.

Conclusions

The two schools highlighted in this study represent very different instructional contexts. In the first case, a somewhat homogenous group of Latino English language learners focuses on language arts and reading at the fourth grade level. The underlying theme of the program is reading to learn. In the second case, a highly heterogeneous group of immigrant and refugee students take an interdisciplinary middle school curriculum, mostly in mainstream classes in a diverse urban school. The underlying approach of that program is Expeditionary Learning and

representing to learn. Both schools make highly effective use of technology to promote academic literacy among their students, resulting in sophisticated student products, highly engaged learners, and high standardized test scores in relationship to school demographics. The keys in both cases are a school-wide commitment to excellence, equity, and development of classroom communities of inquiry.

URL
For complete report findings: http://www.gse.uci.edu/markw/promoting.pdf

Keywords:
English Language Learners, reading, community projects

Study
Running head: High School Laptops - Laptop Initiative Impact: Assessed using Student, Parent and Teacher Data

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Description/Research Question(s)/Major Finding(s)
In the Fall of 1999, researchers were invited to assist in the implementation and study of a Laptop Initiative for high school students. This initiative provided laptop computers for 247 students and 24 teachers who were grouped into 9th grade learning clusters at three high schools. The overall goals of this study centered on technology integration into the curriculum as an enhancement to teaching and learning. This report focuses on examining the integration of laptop computers into the classrooms of three urban high schools and the impact of the initiative on student, teacher and parent knowledge, attitudes and behaviors with regard to the new technology.

Research Questions:

- What differences existed in student, teacher and parent pre and post attitudes and self-efficacy, related to computer technology, after the implementation of the laptop initiative?
- What trends in attitude and self-efficacy data are evident within and/or across the three groups and/or three school settings?
- What conclusions, if any, can be drawn regarding program impact from the parent, teacher and student trend data?

The entire study tracked 247 students, 168 of their parents, and 24 teachers involved in the laptop initiative. The focus of this study was on drawing conclusions about the programs overall effectiveness and impact across students, teachers and parents; as well as the organizational change necessary for sustaining the technology initiative. Students, teachers and parents were tracked from December 1999 through June 2000.

A major concern is centered in the lack of significant change with regard to teacher attitudes about technology. The premise behind the KAB instrument design is that it is necessary to change both knowledge and attitudes in order to affect long-term behavior. The four-month Laptop Initiative intervention was unsuccessful in attaining the necessary attitudinal changes. Further investigation is necessary to see if the intervention is flawed/lacking or if the true culprit in this situation was time!

The initial design and implementation of this technology initiative may have negatively influenced the overall success. District level administrators and outside researchers were the primary designers and implementers of this initiative. Teachers, students, and parents were invited to participate after major decisions had already been finalized at the district level. Teachers consistently expressed frustration with: the lack of information regarding equipment

they were using; the failure to consider building/site differences between the 3 schools when planning for the technology integration and financial support; the constantly changing timelines for laptop delivery and infrastructure support; and the lack of/request for teacher input from day one. The technology initiative clearly failed to consider the impact of essential structural and organizational traits that support continuous teacher learning and fosters organizational learning community development (Argyris & Schön, 1978; Darling-Hammond & McLaughlin, 1995; Huber, 1991; Leithwood, et al., 1998; Rait, 1995).

Today, less than 2 years later, the initiative is no longer functional. Some of the students who participated in the pilot year still have their laptops, while others have returned to the schools. The returned computers have been organized on carts for use in classrooms. Former laptop trained teachers and other technologically savvy teachers have been invited to participate in various technology trainings. However, no additional support (financial or otherwise) has been provided by the school district for program continuation. It is clear that the district and schools have failed to establish the conditions that help to support and maintain a learning organization (Leithwood, et al., 1999).

A detailed implementation plan would have prevented a number of the issues that doomed this project. First, clear expectations for plan implementation and long term programmatic goals would have been explicated. Second, support organizations and personnel would have had a clear picture of what their responsibilities were. Third, a large amount of the misinformation and lack of communication would have been alleviated with a detailed implementation plan. Fourth, training for instructors could have been started earlier, been more comprehensive, and tailored to specific school and individual needs. Finally, long-term implementation and technology infusion might have been possible with a detailed roadmap.

Another recommendation would be to increase the training for the teachers, especially pedagogical. As stated earlier, the teachers received technology training once a month during in-service time (about 2 ½ hours each month). This training primarily concentrated on the technology and technology skills. There was very little attention paid to the pedagogical changes that must take place for the successful integration of technology into classrooms.

Additionally, we recommend training for the learners. Not all of the students in this research were at the same level of educational technology understanding, yet, they were treated as if they were.

Finally, our last recommendation would be to have optional technology training courses, held at convenient times, for the parents. Parental knowledge of technology would, hopefully, translate into parental support of educational technology in the schools.

URL
For complete report findings:
http://www.education.uconn.edu/dept/epsy/news/AERA/aera/laptopfinal.pdf

Keywords:
Teacher attitudes, Student attitudes, Program evaluation

Study
Special Learners Included Through Computers in Education (SLICE) Evaluation Report, 2003

Author (s)
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For CREP, Center for Research in Educational Policy

Description/Research Question(s)/Major Finding(s)
Special Learners Included through Computers in Education (SLICE) is a computerized educational system that allows printed text to be converted into electronic text, and then spoken aloud by a computer. The system was developed in 1995 to support learners who have difficulty with written language, specifically dyslexia, ESL, or LEP. The primary mission of SLICE is to cultivate inclusion to the maximum extent possible and to foster academic success in the general curriculum.

Participation in the SLICE program is based on a student's need for alternative access to written material in school. In order to meet those needs, SLICE students have online access to digitized versions of school textbooks, novels, or other instructional material that their teachers have assigned for reading.

Since 1997, SLICE has been used by individuals, families, public and residential schools, adult literacy agencies, and tutorial labs in North Dakota, Texas, Colorado, Arizona, and Utah. Anecdotal evidence in these locations indicated that SLICE students who consistently read their assignments using SLICE became better readers. The purpose of the current study was to conduct a more systematic and objective evaluation of the effects of SLICE in raising student achievement.

Research Questions:

1. Did students who used SLICE have greater gains in reading achievement compared to the control group?
2. Did students who started with lower reading achievement have higher gain scores than did those who started with higher reading achievement?
3. Was the level of student involvement with SLICE related to increases in reading achievement scores?

60 students from two schools serving Native American students from the Navajo Nation in the Four Corners region of 2 the United States were given an opportunity by their schools to participate in SLICE in the 2001-2002 school year. Of these 60 candidates, 49 had complete pre/post test data available and 11 were eliminated due to incomplete data. Of the remaining 49 students, 30 used SLICE regularly (SLICE treatment group). The remaining 19 students comprised the Control group, consisting of students who were eligible for SLICE, but found it impossible to participate because they lacked access to computers with an internet connection or had classroom teachers who did not allow them to use SLICE in an inclusive environment.

The main outcomes of the study need to be interpreted with the sampling limitations in mind. They consist of:

- SLICE students had significantly higher gain scores than did Control students.
- Lower achieving students gained more than high achieving students for both SLICE and Control groups.
- Younger students appeared to have larger gains in both samples.
- The students who participated for a longer time in SLICE showed higher gains.

Although the overall results are positive, caution must be used in interpreting the results. Change scores are confounded with grade levels. An additional concern is the ex-post facto nature of the design, whereby students were grouped not on a random or matched basis, but on the basis of contextual events. For these reasons, the above overall positive effects must be considered as only suggestive pending further studies with larger samples and closer treatment-control matching.

URL
For complete report findings: http://apelslice.com/downloads/slice_evaluation_report.pdf

Keywords:
Computerized educational system, student achievement

Study
The Effect of Computers on Student Writing:-A Meta-Analysis of Studies from 1992 to 2002

Author (s)
Amie Goldberg, Michael Russell & Abigail Cook
The Journal of Technology, Learning, and Assessment
Volume 2, Number 1 · February 2003

Description/Research Question(s)/Major Finding(s)
Meta-analyses were performed including 26 studies conducted between 1992–2002 focused on the comparison between k–ı2 students writing with computers vs. paper-and-pencil. Significant mean effect sizes in favor of computers were found for quantity of writing (d=.50, n=ı4) and quality of writing (d=.4ı, n=ı5). Studies focused on revision behaviors between these two writing conditions (n=6) revealed mixed results. Other studies collected for the meta-analysis which did not meet the statistical criteria were also reviewed briefly. These articles (n=35) indicate that the writing process is more collaborative, iterative, and social in computer classrooms as compared with paper-and-pencil environments. For educational leaders questioning whether computers should be used to help stu-dents develop writing skills, the results of the meta-analyses suggest that, on average, students who use computers when learning to write are not only more engaged and motivated in their writing, but they produce written work that is of greater length and higher quality.

Fourteen independent effect sizes were extracted from ı4 studies that com-pared quantity of writing, as measured by word count, between computer and paper-and-pencil groups.

This study employed meta-analytic techniques to summarize findings across multiple studies in order to systematically examine the effects of computers and student learning. Although a large number of studies initially identified for inclusion in the meta-analysis had to be eliminated either because they were qualitative in nature or because they failed to report statistics required to calculate effect sizes, the analyses indicate that instructional uses of computers for writing are having a positive impact on student writing. This positive impact was found in each independent set of meta-analyses; for quantity of writing as well as quality of writing.

Early research consistently found large effects of computer-based writing on the length of passages and less consistently reported small effects on the quality of student writing. In contrast, although our meta-analyses of research conducted since 1992 found a larger overall effect size for the quantity of writing produced on computer, the relationship between computers and quality of writing appears to have strengthened considerably. When aggregated across all studies, the mean effect size indicated that, on average, students who develop their writing skills while using a computer produce written work that is .4 standard deviations higher in quality than those students who learn to write on paper. On average, the effect of writing with computers on both the quality and quantity of writing was larger for middle and high school students than for elementary school students.

For educational leaders questioning whether computers should be used to help students develop writing skills, the results of our meta-analyses suggest that on average students who use

computers when learning to write produce written work that is about .4 standard deviations better than students who develop writing skills on paper. While teachers undoubtedly play an important role in helping students develop their writing skills, the analyses presented here suggest that when students write with computers, they engage in the revising of their work throughout the writing process, more frequently share and receive feedback from their peers, and benefit from teacher input earlier in the writing process. Thus, while there is clearly a need for systematic and high quality research on computers and student learning, those studies that met the rigorous criteria for inclusion in our meta-analyses suggest that computers are valuable tools for helping students develop writing skills.

URL
For complete report findings:
http://escholarship.bc.edu/cgi/viewcontent.cgi?article=1007&context=jtla

Keywords:
Student Achievement, writing

Study
The Impact of Maine's One-to-One Laptop Program on Middle School Teachers and Students, Phase One Summary Evidence, Research Report #1, 2004

Author (s)
Report prepared by David L. Silvernail, Director
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University of Southern Maine Office
February 2004

Description/Research Question(s)/Major Finding(s)
The initial phase of the Maine Learning Technology Initiative (2002-2004) has provided all seventh and eighth grade students and their teachers with laptop computers, and provided schools and teachers technical assistance and professional development for integrating laptop technology into their curriculum and instruction.

Research Questions:
1. How are the laptops being used?
2. What are the impacts of the laptops on teachers and students?
3. What obstacles, if any, have schools, teachers, and students encountered in implementing the laptop program?

The laptops are being used widely by teachers and students, and their use has improved learning. Teachers report using them a great deal in developing lesson plans, and in conducting research for lesson plans and instruction. Likewise, students use them to conduct research and complete class assignments. Additionally, use levels for both teachers and students have increased over time.

As a result of the growing usage levels, there have been many positive impacts from this initial implementation of the laptop program. Teachers and students alike report improvements in the quality of students' work, the students learn more, and that students increase their understanding of what they are learning. Students of all types are more motivated to learn, and more engaged in the learning process. And interaction about learning and content between teachers and students, and students with other students has increased substantially.

Some obstacles, however, have been encountered in this initial phase of implementing the laptop program. Some teachers report technical problems, and many feel they need more technical support. Many teachers also report that the lack of sufficient professional development activities, and the lack of time to explore and learn more about the uses of the laptops, hinders them in further integrating the technology into their teaching and learning. Additionally, school districts report some increased expenses in implementing the program in their middle schools.

As expected, laptop use is greater for seventh grade teachers, in almost all areas. Those teachers have one year more experience with the laptops than eighth grade teachers who received their laptops for the first time in Fall 2003. The one area where there is no difference between seventh

and eighth grade teachers is in using the laptops to communicate with colleagues inside the school, across the state and country, and, in some cases, to communicate with international colleagues.

On average, use levels for teachers who rate their skill level as “Advanced” or “Expert” is 20% to 30% higher than those reporting lesser skill levels. This evidence suggests a major factor influencing use levels is the technology literacy levels of teachers.

Additionally, the amount of participation in professional development programs are related to use levels. Figure 4 reports use levels for two groups of teachers; those who have attended fewer than four professional development activities, and those who have attended four or more activities. Use levels are higher in all areas for those who have participated in more professional development workshops and activities. A majority of the teachers surveyed feel they are supported in acquiring technology skills, but that the time needed to acquire the skills is very limited.

Overall, usage is highest in Language Arts classes (93%), Science classes (91%), and Social Studies classes (88%). Usage has increased in all five content areas, with the steadiest increase in the areas of Art and Music, and Language Arts.

Over 70% of teachers reported that having laptops helped them to more effectively meet their curriculum goals, and individualize their curriculum to meet particular student needs.

Over 75% of the students surveyed in Fall 2003 indicated their laptops helped them be better organized, and that they are more likely to edit their work with laptops. Almost 70% indicated they do more work when they use their laptops, and are more involved in school and with their classmates. Over 70% of the students report that they prefer to use their laptops, that the laptops allow them to get their work done more quickly and with better quality, and that the laptops make school more interesting. And two-thirds of the students report that the laptops help improve their understanding of what they are learning.

What impact has the laptop had on attendance, behavior, and achievement? Information in the figures above indicates that teachers believe the laptops have influenced student attendance, behavior, and learning in very positive ways. Evidence from the principal surveys indicates that principals agree with their teachers. Approximately 30 to 40% of the principals report that the laptop program has had a positive impact on student attendance and behavior, and over 70% report positive impacts on student motivation and learning.

Approximately one-half of the schools report that the creation of student technology support teams has proven very beneficial. These teams, many times referred to as iTeams, are comprised of a group of students who are all interested in learning more about the laptops and helping their classmates and teachers in using this technology. Student iTeam members are typically brought together on a regular basis to receive training in the various laptop applications, in addition to troubleshooting common technical problems. In the classroom, these students act as technology support persons, helping out in the classroom while at the same time improving their own technological and interpersonal skills.

A preliminary analysis of some of the more successful schools reveals that one factor which contributes to their greater success is the presence of one or more key individuals in the schools who have served as champions of the laptop program and have provided strong leadership during implementation of the program. In some cases, this was the school principal, in others it was a formally designated or informally designated teacher leader, and in a few cases it was a technology coordinator. Teachers in these more successful schools have been more involved from the beginning in discussions about how, when, and how quickly to implement the program. These teachers also have been encouraged and supported in participating in professional development activities designed to help the teachers integrate the technology into their classrooms and instruction. Technology support is provided by technology coordinators, and in many cases, by student technology support teams. And finally, these more successful schools allow students to take the laptops home.

URL

For complete research findings:
http://www.usm.maine.edu/cepare/pdf/mlti/MLTI%20Phase%20One%20Evaluation%20Report%201.pdf

Keywords:
middle school, student attitudes, teacher attitudes, staff development

Study
The Impact of Maine's One-to-One Laptop Program on Middle School Teachers and Students
Use of Laptop Computers and Classroom Assessment: Are Teachers Making the Connections?
Research Report #4

Author (s)
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Description/Research Question(s)/Major Finding(s)
In 2002-2003 all students and teachers in seventh grade classrooms received a wireless laptop computer. But what does the implementation of laptop computers look like up close? This study focuses on the findings from a study of three teachers based on classroom observations and informal interviews. All of the teachers have used the laptop computer technology over the past year. The specific purpose of the study is to examine the use of laptop computers by teachers' to support class room assessment strategies. There were three on-site visits to Mountain River Middle School from December, 2002 to April, 2003.

Over the course of the site visits, each teacher had opportunities to demonstrate the use of laptop computers for instruction and to answer questions about their experiences.

From what I saw there is little doubt that teachers and students have been energized by the use of laptop computers. Computers are powerful gateways to open-ended learning, but teachers themselves wonder, has the level of achievement been changed? My concerns remain with the classroom assessment environment, the quality of feedback to students, the design and use of testing and assessment, and the effective communication of testing results to support learning.

Without careful instructional planning the presence of laptop computers did not account for improvements in one of the most basic instructional questions, how clearly do students understand the achievement targets? The projects which incorporate the open-ended nature of the internet did little to improve the clarity and coherence of learning targets. In fact, it appeared that web-based learning contained numerous sources of confusion in expectations of the curriculum, the match of methods to the achievement target, and the sources of error and mis-measurement in rubric and in the test questions.

Key questions about other aspects of classroom assessment remain. Do teachers have clear instructional goals? Have the computers contributed to improvement in the use of assessment information? From my perspective, the effectiveness of the laptop computer initiative still rests on the shoulders of the teachers who must understand the role of instructional media design and its connections with clear, coherent classroom assessment.

URL
For complete report findings:
http://www.usm.maine.edu/cepare/pdf/flti/MLTI%20One%20Evaluation%20Report%204.pdf

Keywords:
Student Assessment

Study
The impact of mobile computers in the classroom – Results from an ongoing video study

Author (s)
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Description/Research Question(s)/Major Finding(s)
The present study examines 45 lessons (24 with and 21 without laptop use) that where videotaped over the course of 2 ½ years in a laptop program of a German high school. In March 1999, one of the first laptop programs in Germany started at the Evangelisch Stiftisches Gymnasium Guetersloh. More than 300 students of this high school and their teachers were gradually furnished with networked laptop computers. Students of four cohorts entered the program in grade 7 and are using laptops regularly at school and at home until the end of grade 10.

Observational data was gathered to investigate changes of teaching strategies and classroom practice. A randomly selected sample of lessons of the laptop classes was videotaped over the past 2½ years. The same classes and the same teachers were recorded repeatedly. As the laptop classes are not using their computers every day, lessons with and without laptop use could be recorded in the same classes with the same teachers. Confounding effects that result from comparing different classes or teachers with different teacher styles, could thus be reduced. Subjects covered are mathematics, German, and English.

For the form of instruction, the descriptive analysis showed that guided discussions are the most prominent form of instructional activity both in laptop as well as in non-laptop lessons. Laptop lessons differed most strongly from non-laptop lessons in that students work individually more frequently. Qualitatively, it was interesting to note that phases of individual work were often longer when the laptop was used than in non-laptop lessons. Group activities were also observed slightly more often in laptop lessons than in non-laptop lessons and tended to be more project-based, while group activities in traditional lessons were shorter exercises that could be solved in a limited amount of time, typically within the respective lesson. The frequency of lecture and pair work is almost identical in laptop and non-laptop lessons.

The results show that the major change in the laptop classroom is an increase in individual work. Students work more often independently, which according to many teachers, results in a higher degree of activation than in traditional lessons. It seems that while extensive group projects have been carried out with the laptops, this was rather the exception than the rule. If only subjective data had been gathered, these projects could have easily been overemphasized. The same is true for the change from teacher- to student-centered instruction. While there are clear indications that the laptop classroom is becoming more student-centered, the video analysis also shows that the change is less profound than only looking at the subjective data might have suggested.

The use of video proves to be a helpful tool to corroborate findings that are based on subjective data. Results, which were derived from questionnaires and interviews, could be confirmed through observation in many cases, thus raising their credibility. While it should not be concluded that one source of data has more value than the other, this study shows that combining

observational and survey/interview data is worthwhile to enhance the validity of a study's results. It reduces the danger of misinterpreting findings and helps to detect possible biases in subjective reports.

URL

For complete report findings: http://www.notesys.com/Copies/aect01.pdf

Keywords:

Program evaluation, teaching and learning

Study
The Impact of Portable Technologies on Teaching and Learning: Year Two Report, Athens Academy, a private school in Georgia, 2000-2001 school year

Author (s)
Janette R. Hill, Ph.D., Thomas C. Reeves, Ph.D., Michael Grant, Shiang-Kwei Wang
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Description/Research Question(s)/Major Finding(s)

This is year two of a laptop initiative. It was preceded by an intensive summer of technology training and planning for use of the laptops in their classrooms involving middle school teachers. Eight middle school teachers (grades 7 and 8) and 36 upper grade school teachers (grades 9-12) participated in the study. The middle school students received their laptops during the second year of the project (therefore the primary focus of the study). Other grades would receive the laptops in the fall term of year three.

There were six different types of data collection activities: surveys, observations, interviews/focus groups, test scores, usage logs, and notes from meetings with various groups.

Research Questions:

Enhancing the Teaching and Learning Environment

1. Are there differences in roles/responsibilities that can be attributed to the ubiquitous computing environment?
   There does not appear to be differences in roles/responsibilities in practice. However, both students and teachers are asking for changes.

2. Are there differences in the processes of learning that can be attributed to the ubiquitous computing environment?
   It does appear that there are differences in the processes of learning that can be attributed to the laptops. The increased access to the Internet/Web has enabled an increase in the use of resources in the classroom. There has also been an increase in presentations, both by teachers and students.

3. What are the affective implications of the ubiquitous computing environment?
   While we do not have a lot of data that supports evidence of change in this area, we did find evidence of leveling of the playing field. That is, there was an increase in the percentage of 7th and 8th graders at the end of the year who did not perceive that their peers knew more than they did. This was a significant change prior to receiving the laptops when many students indicated that they felt like their peers did know more than them.

   Enhancing Achievement and Performance

4. How much is learned in English, History/Geography, Math, and Science that can be attributed to the ubiquitous computing environment?

At the end of the second year, there was little or no evidence of quantitative differences in achievement and performance that could be directly attributed to the laptops.

Enhancing Key Qualifications for the Information Age

5. Are there differences in cognitive skills that can be attributed to the ubiquitous computing environment?
   There is little or no evidence that changes in cognitive skills were occurring as of the end of the second year.

6. Are there differences in media literacy skills that can be attributed to the ubiquitous computing environment?
   Yes, there is some demonstration of this in the 7^{th} and 8^{th} grade. Students and teachers ar thinking differently about how to use information sources for learning.

The overall conclusions can be characterized as cautiously optimistic. Although we have seen only modest changes in teaching and learning activities and have been able to detect few effects in terms of achievement and performance (with the notable exception of Information Age Skills), we found generally positive attitudes toward the entire initiative among both students and teachers. We believe that these positive attitudes will provide a strong foundation for more obvious shifts in teaching and learning practices and eventual impact on diverse areas of achievement and performance.

URL
http://lpsl.coe.uga.edu/projects/aalaptop/image/PDF/AAYearTwoRpt.pdf

Keywords:
teaching, learning, achievement, information age, grades 7-12

Study
The relationship between models of student laptop computer use and teacher instructional behavior

Author (s)
Barbara A. Ashmore, B.S., M.Ed.
University of North Texas, 2001

Description/Research Question(s)/Major Finding(s)
This study investigated the relationship between four models of student laptop computer use and three components of teacher instructional behavior: planning, implementation of instruction, and evaluation of instruction. The four models of use: full access, dispersed, class set, and mixed, represented the numerous ways teachers in public and private schools and school districts nationwide implemented student use of laptop computers. Teacher planning behavior was investigated with regard to time, frequency, complexity, difficulty, the need for revision, and use of technological resources and materials. Implementation of instruction was examined with regard to student grouping, instructional strategies, instructional content/subject matter, teacher and student roles, assignments and learning tasks, and instructional activities. The evaluation of instruction component was examined with regard to assessment tasks, grading, and assessment of homework.

Models of student laptop use:

1. *Full access model* was one in which each student had a laptop computer for his/her use at all times, both at home and school.
2. *Dispersed model* was one in which laptop computers were dispersed throughout a grade or school. Thus in any given class, there would be students with laptop computers and students without laptop computers.
3. *Class set model* was one in which a school or school district had sets of laptop computers available for teachers to check out for specific periods of time during which all students had laptop computers. (Students may or may not be able to take laptop computers home for use.)
4. *Scattered model* was one in which a school or school district distributed a few laptop computers to each classroom within the school or district with little opportunity for students to take the laptop computers home.
5. *Mixed model* was one in which a school or school district combined two of the models either within or between schools.

Research Questions:

1. What characterizes teacher planning behaviors with regard to time, frequency, complexity, difficulty, need for revision, and use of technological resources and materials when students use laptop computers in one of four models of use: full access, dispersed, class set, or mixed?
2. Are there statistically significant differences between the four models of use: full access, dispersed, class set, and mixed, when students use laptop computers and teacher planning

behaviors with regard to time, frequency, complexity, difficulty, revision, and use of technological resources and materials?

3. What characterizes teacher implementation of instruction with regard to student grouping, instructional strategies, instructional content/subject matter, teacher and student roles, assignments and learning tasks, instructional activities, instructional materials, and student and teacher interactions when students use laptop computers in one of four models of use: full access, dispersed, class set, or mixed?
4. Are there statistically significant differences between the four models of use: full access, dispersed, class set, and mixed, when students use laptop computers and teacher implementation of instruction with regard to student grouping?
5. Are there statistically significant differences between the four models of use: full access, dispersed, class set, and mixed, when students use laptop computers and teacher implementation of instruction with regard to instructional strategies?
6. Are there statistically significant differences between the four models of use: full access, dispersed, class set, and mixed, when students use laptop computers and teacher implementation of instruction with regard to instructional content/subject matter?
7. Are there statistically significant differences between the four models of use: full access, dispersed, class set, and mixed, when students use laptop computers and teacher implementation of instruction with regard to teacher and student roles?
8. Are there statistically significant differences between the four models of use: full access, dispersed, class set, and mixed, when students use laptop computers and teacher implementation of instruction with regard to assignments and learning tasks?
9. Are there statistically significant differences between the four models of use: full access, dispersed, class set, and mixed, when students use laptop computers and teacher implementation of instruction with regard to instructional activities?
10. What characterizes teacher evaluation of instruction behaviors with regard to assessment tasks, grading, and homework assessment when students use laptop computers in one of four models of use; full access, dispersed, class set, or mixed?
11. Are there statistically significant differences between the four models of use: full access, dispersed, class set, and mixed, when students use laptop computers and teacher evaluation of instruction with regard to assessment tasks?
12. Are there statistically significant differences between the four models of use: full access, dispersed, class set, and mixed, when students use laptop computers and teacher evaluation of instruction with regard to grading?
13. Are there statistically significant differences between the four models of use: full access, dispersed, class set, and mixed, when students use laptop computers and teacher evaluation of instruction with regard to homework assessment?

Conclusions:

- The role of both students and teachers became more constructivist when students had access to laptop computers in the full access and mixed models.
- Instructional activities became more constructivist in the full access and mixed models as did assessment practices in the full access and mixed models of use.
- Teachers were more likely to place students in small groups in the dispersed model.
- In the mixed model, teachers became more collegial and used technological resources and materials more often when they engaged in planning.

- When student use of laptop computers was integrated into teacher instructional behaviors, teacher practice was affected. Teachers were more likely to employ a constructivist approaches in the classroom.
- The full access and mixed models of use were more likely to advance constructivist instructional practice in the classroom than either the class set or dispersed models of use. Teachers working in the full access and mixed models, for example, perceived themselves as learning along with students more often. Moreover, they utilized pedagogy conducive to a constructivist approach in the classroom such as cooperative learning more frequently than teachers in the class set or dispersed models of use.
- In both the full access and mixed models, students and teachers were more collegial and collaborative than teachers working in the class set and dispersed models of use.
- The full access and mixed models of use are more likely to promote constructivist evaluation of instruction than either the class set or dispersed models of use. Constructivist assessment tasks such as students conferencing with their peers about their work, explaining their thinking in writing or in discussion, or presenting as part of a group were practiced more frequently by teachers in the full access and mixed models of use. Likewise, these same teachers were more likely to elicit student ideas and opinions or keep student items in a portfolio with greater frequency than teachers in the class set or dispersed models of use. Thus, the greater impact of the full access and mixed models of use illustrates the relationship between models of student laptop computer use and teacher instructional behaviors with regard to evaluation of instruction.
- Planning was more demanding of teachers in the mixed model of use than in either the full access, class set, or dispersed models. Teachers in the mixed model of use spent more time planning and planned more frequently. However, the increased demands of planning created by the mixed model of use, may also be responsible for the greater degree of teacher collegiality and use of technological resources evident in this model of use. Not only did the mixed model of use produce a greater impact on teacher instructional behaviors with regard to planning than the full 100 access, class set, and dispersed models of use, but it also illustrated the relationship between models of student laptop computer use and teacher instructional behaviors with regard to planning.

URL
For complete report findings: http://www.iittl.unt.edu/iittl/dissertations/ashmore.pdf

Keywords:
models of laptop use, teacher planning, instructional strategies, student grouping, teacher/student roles, assessment

Study

Trading Roles: Teachers and Students Learn with Technology; Maine Learning Technology Initiative Research Report #3

Author (s)

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Description/Research Question(s)/Major Finding(s)

The Maine Learning Technology Initiative (MLTI) is a state-wide program that provides wireless laptop computers to all seventh- and eighth-grade students and teachers. This paper describes the author's analysis of data from a state-wide evaluation conducted during the first year and a half of the program. The data include: 301 interviews with administrators, teachers, students, and parents from 23 schools across Maine; state-wide surveys of teachers, students, and technology coordinators; and 22 classroom observations from 7 schools.

Research questions:

- What role changes do teachers and students describe as resulting from laptop use in the classroom, and what benefits do they associate with these changes?
- How do teachers structure learning tasks differently as a result of laptop use?
- What broader shifts in pedagogy and instructional approach do teachers report?

The introduction of one-to-one wireless computing in middle school classrooms in Maine appears to have catapulted students into the role of "teacher" and teachers into the role of "learner" in immediate and obvious ways. Although the evaluation of the program did not fully anticipate or focus on this phenomenon, it became clear from a reading of the first round of interview and observation data that dramatic changes were rapidly occurring in classrooms on many different levels.

Students' role as "teachers" of technology generally took two forms: students helping/teaching other students in the classroom or school, and students helping/teaching teachers or other adults in the classroom or school.

Teachers from both pilot and non-pilot schools described how their role in the classroom had shifted as a result of laptop use. They characterized this shift as moving away from the role of "keeper of the knowledge" to one of "learner" within a "community of learners" in the classroom. Teachers characterized their relationship with students as becoming more "reciprocal" since the introduction of the laptops.

Principals and teachers also reported broader shifts in pedagogy and practice as a result of laptop use in the classroom. Among the changes they noted were: movement away from direct instruction to the role of "facilitator" or "coach"; increased use of an inquiry approach as opposed to memorization and practice; increased use of interdisciplinary or integrated approaches; increased use of cooperative or collaborative structures for learning; and increased use of differentiated or individualized learning tasks.

Perceived Benefits of Role Shifts and Instructional Changes

- Benefits for Students:
  - Confidence, self esteem
  - Increased interaction with adults
  - Increased collaboration with peers
  - Increased student impact on learning tasks
  - Increased opportunities for individualized learning
- Benefits for Teachers:
  - Teachers' technology knowledge and skill
  - Help with technology questions, problems
  - Classroom management
- Benefits for Classrooms and School Communities
  - As teachers became more aware of students' technology skills and involved students to a greater extent in helping and teaching others, students gained more respect from teachers and other staff members in the school. Greater respect for students' technology skills could translate to greater respect generally between teachers and students in the school, and more positive forms of interaction and collaboration.
  - Students who traditionally held more marginal positions, socially or academically in the classroom or school, gained greater respect from their peers and a sense of equity. Teachers saw evidence that the laptops helped students to "build bridges" across the barriers of academic ability, disability, gender, social grouping, and grade level.
  - In recasting their role as "learners" with students, teachers encouraged the development of "communities of learning" in the classroom, and a shared sense of excitement in the learning process. By showing students that it is natural not to know all things, to be curious, and to learn by exploring and sharing, teachers were modeling positive attitudes toward learning and a practical approach to the learning process.
  - As teachers used the laptops as a vehicle for making broader changes in instructional practice, such as collaborative, interdisciplinary, and inquiry approaches to learning, they modeled new ways of thinking about teaching and learning for their peers. Although teaching remains highly idiosyncratic, the kinds of collaboration that teachers engaged in to incorporate technology into their practice could easily lead to school-wide changes in classroom practice.

URL

For complete report findings:
http://www.usm.maine.edu/cepare/pdf/mlti/MLTI%20Phase%20One%20Evaluation%20Report%203.pdf

Keywords:

student attitudes, teacher attitudes, teaching and learning

Study
Ubiquitous Computing for Teaching, Learning, and Communicating: Trends, Issues & Recommendations

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Description/Research Question(s)/Major Finding(s)
What will it take for computing technologies to have desirable effects in formal learning environments such as the schools we have today? There are many answers to this question, including better teacher training, closer integration into the curriculum, and a more precise alignment with assessment (Roblyer, Edwards, & Havriluk, 1997). However, some researchers examining the integration of technology in the schools maintain that one of the primary factors impacting success is more access to the technology (Fisher, Dwyer, & Yocam, 1996). It is proposed that access to computing must be as simple and easy as possible, and available on a just-in-time, when-needed basis. Indeed, some have argued that computing technologies must become mission critical tools, creating a situation where not having them would prevent learners and teachers from completing their work on a day-to-day basis (Papert, 1993).

Ironically, technology integration plans in most school districts may actually work against computing technologies becoming mission critical to the educational processes in those districts because, as noted above, most schools continue to rely upon shared computer labs or limited numbers (e.g., 1-3) of computers in individual classrooms. As a result, the actual time each student in these schools has access to computing is severely limited. In an era of exponential growth of information and increased demands for technology skills in the workplace, some argue that occasional access to computing technologies is no longer sufficient for students, especially in middle and upper grades (Stager, 1995). A new model for accessing and using computing technologies for teaching, learning and communicating is needed if these technologies are to influence school practice in a meaningful way.

As a theory of learning, constructionism provides a powerful rationale for the integration of ubiquitous computing within a school via laptops. As a strategy for educational practice, constructionism provides models that integrate problem-based or project-based learning approaches with collaborative learning principles. Resnick’s (1996) description of “distributed constructionism” as an effective model for groups of students to collaborate in the construction of meaningful artifacts provides another rationale for the integration of laptop computers into schools. Students can use their networked laptops to collaborate online, thereby functioning as “knowledge building communities” (Scardamalia & Bereiter, 1991).

Honebein (1996) lists seven pedagogical goals for designers of constructivist learning environments:
1. Provide experience with the knowledge construction process.
2. Provide experience in and appreciation for multiple perspectives.
3. Embed learning in realistic and relevant contexts.

4. Encourage ownership and voice in the learning process.
5. Embed learning in social experience.
6. Encourage the use of multiple modes of representation.
7. Encourage self-awareness of the knowledge construction process.

Although some aspects of these pedagogical goals may be implemented without the provision of ubiquitous computing via laptops, it should be obvious that such resources may enhance all of them. This is especially true for the last two, encouraging multiple modes of knowledge representation and self-awareness of the knowledge construction process Students should come to recognize their laptops and the programs on them as powerful cognitive tools for knowledge construction.

The amount of time available for learning within a curriculum defines the “opportunity to learn” factor. Carroll points out that a weakness of many school schedules (e.g., 180 days a year divided into 60-minute classes devoted to different subjects) is that they provide less time than lower aptitude students need to achieve a given set of objectives. Content “covered” in a curriculum is another variable included in the “opportunity to learn” factor. The provision of a ubiquitous computing environment via laptop computers has great potential for extending time available for learning so that children who need more time can have it and those who wish to move ahead can do so without waiting for the rest of the class to catch up.

To fully realize their potential, schools must integrate technologies on “high levels." As Hooper and Rieber (1995) argue, the focus should be on “educational technology” rather than on “technology in education.” We need to move toward thinking of "idea technologies," emphasizing why technology integration is important and how it can extend and enhance what we do in the classroom. Idea technologies need to blend with technological production (i.e., the use of hardware and software to create things) to promote learning in classrooms. Creating an effective “partnership of idea and product technologies” (Hooper & Rieber, 1995) is a major challenge related to integrating laptop computers into learning environments.

URL
For complete report findings:
http://lpsl.coe.uga.edu/projects/aalaptop/pdf/UbiquitousComputing.pdf

Keywords:
Teaching and learning

Study
Using Technology to Create and Enhance Collaborative Learning

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Description/Research Question(s)/Major Finding(s)
Oklahoma Christian University has implemented a ubiquitous computing program where every student and faculty member are equipped with IBM ThinkPad laptops that connected to a wireless network. The technological enhancements provided by this program helped to create an environment where collaboration between students and faculty could be increased. During the first full year of implementation, one course typically taught in a lecture-based format was re-designed to foster more collaboration and active learning. The instructor enhanced the course with collaborative technology, delivered most of the first exposure to the materials online, and created collaborative assignments to be done during the classroom time. A survey and several interviews were conducted to glean student feedback. Students found the course challenging and they rose to meet that challenge.

The model course consisted of 37 freshman-level students. The model course was designed to make heavy use of technology, yet the technology was meant to be "transparent," used as a tool of the trade (much like a pencil or textbook). Priority was given to student learning. If the technology inhibited student learning, it was changed or removed. This course was designed so that it could be offered as a hybrid course (i.e., a course that has both face-to-face and online components) or as a distance education course. The course followed a 20/80 rule (sometimes 10/90), meaning only be about 20% of face-to-face time was used for lecture while about 80% of the face-ro-face time was designated for students to collaborate on assignments or for in-class presentations (Poindexter et. al., 2001).

The students were grouped into teams in order to collaborate on assignments and the final project. The groupings were based on several criteria: results of the Keirsey version of the Myers-Briggs temperament analysis, learning styles, and self-selection (limited).

A survey was conducted at mid-term of the course and several interviews with students were conducted at various times throughout the semester. Each of these assessments revealed some interesting information. First, 50% of the students agreed or strongly agreed that the technology used in this course enhanced their ability to learn the material. The students found themselves interacting with the material and with each other more in this course than in any of their other courses. Because the lectures were online and because the technology allowed them to communicate with each other so much easier, they found themselves engaged in the course material even on days the class was not meeting. The survey and the interviews uncovered another interesting fact. On the survey, the students were asked if they agreed or disagreed with the following statement: "If given the opportunity to take this class again, I would choose an Acts class with a more traditional lecture format." Fifty-four percent of the students agreed or

2. Visits from the evaluators combined with surveys revealed that laptops were being used frequently and in a variety of ways. In Science, uses included virtual dissections, virtual field trips, lab write-ups, drill-and-practice statewide tests, databases and spreadsheets, WebQuests, and the creation of Web pages. In Mathematics, students used computer assisted instruction software, sketchpad software, spreadsheets, drawing programs, and sites where teachers create tests that student's access online.
3. From interviews with students, teachers, parents, and administration it was concluded that there was: 1) greater access to resources and information available to students and families, 2) increased student motivation, engagement, interest, and self directed learning, 3) more student interaction with teachers, 4) better-organized students, 5) easier access by teachers and students to up-to-date instructional content, 6) more flexibility for teachers during instruction, 7) increased professional productivity and greater collaboration among teachers, 8) improved home-school communication, 9) an increased need for planning time to make good use of the laptops, and 10) added challenges for teachers to manage classrooms and discipline.
4. Extensive staff development provided by technology trainers in every building was essential for program success.
5. Hardware, software, and technical support, available in each building, was essential for program success.
6. While the program's success was aided by high-level instructional and technical support, barriers included high incidence of breakage and repair, short laptop battery life, students' forgetting to bring laptops to school, management and discipline incidence, and time for teachers to plan and develop lessons.

URL
For complete report findings: http://ubiqcomputing.org/FinalReport.pdf

Keywords:
math, science, middle school, high school, hardware support

Study
Using Technology To Enhance Connections Between Home And School

Author (s)
Prepared for Planning and Evaluation Service, U.S. Department of Education by:
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Description/Research Question(s)/Major Finding(s)
The purpose of this report is to synthesize research on the effectiveness of programs that use technology to improve links between home and school, with the aim of guiding future evaluation and policy. To develop this report, we conducted a comprehensive review of research on the subject of technology-supported programs that link home and school. We also gathered data from interviews and observations of selected programs to learn more about how the programs are implemented and their prospects for sustainability and replicability. The report also includes findings from case studies of eight programs conducted in spring 2001.

The research base from which we drew was relatively small, because there have been few outcome studies that have examined these programs' effectiveness, in terms of either 2 enhancing student achievement or increasing parent-school communication. The research designs used in most of these studies, moreover, make it difficult to draw conclusions about whether providing technology access to students through desktop or laptop programs causes increases in student achievement or whether using existing technology access to promote greater parent involvement causes improvements in parent-school communication. Only 19 studies that examined outcomes could be identified. Just 2 of the 19 outcome studies included in the review relied on experimental designs. Of the remaining quasi-experimental studies reviewed, 10 attempted to ensure that treatment and comparison groups were similar at the outset of the study, and 7 studies did not examine the match between treatment and comparison groups at all.

The specific contribution of technology is difficult to measure because many of the programs studied that used technology to link home and school were embedded within larger school reform efforts. In fact, on the whole, these were the programs that reported the largest effects. In these programs, technology was intended to support or augment initiatives aimed at increasing expectations for all students, transforming teaching practices, or developing students' literacy. Evaluation results from these studies suggest that although it may not be easy to determine whether greater access to technology at home in itself makes a difference, enhanced home access may work in combination with larger reform efforts to improve learning outcomes for students.

This report contains less information about the impacts of programs on parent involvement in the learning process and parent-school communication because fewer evaluation studies reported on these outcomes. Just seven studies reported any data on parent outcomes, and only two had enough data to compute the magnitude of the effect of programs. The most frequently used source of data about parents came from self-report surveys about parent perceptions, usually administered at one point toward the end of the program or school year. Our synthesis is not unusual having only a small number of studies reporting on parent involvement outcomes. In a recent meta-analysis, Fan and Chen (2001) observed that there are no widely used measures of parent involvement in children's learning, and though there are documented effects of parent

involvement in student learning, educational research in this area is still in an early stage of development.

The positive associations between program participation and achievement were highest in programs that were embedded within larger reform initiatives. It may be that in these reform-embedded programs, technology augments and supports the school change process. It is possible to interpret the studies of laptop and desktop programs in a reform context as providing little evidence for the effectiveness of technology, but such an interpretation ignores the possible additive effects of technology in the reform process. Most reforms rely on multiple strategies; these strategies are all expected to build toward a common goal, such as improving equity or promoting student achievement. It may be that technology contributes toward the goals of a larger reform process.

The vision for improving educational opportunities to learn with technology by linking home and school more closely is one to which many schools and districts have a strong commitment. Many more schools and districts have planned programs like the ones we reviewed that will be implemented in the near future. To understand their likely impact better, we will need more studies that examine the broad range of impacts these programs might have, not just on students but also on parent-teacher and parent-child relationships. We will need better measures of these impacts and also better documentation of what kinds of program designs are most effective. Finally, we will need a shared commitment among researchers to report common outcome indicators, so that policy- makers, evaluators, and the public can clearly understand the impact of educational technology programs that bridge home and school.

URL
For complete report findings: http://ctl.sri.com/publications/downloads/Task1_FinalReport3.pdf

Keywords:
Home-school connection

Study
Using Technology to Improve Academic Achievement in Out-of-School-Time Programs in Washington, D.C., 2001

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Description/Research Question(s)/Major Finding(s)
During the summer, DCPS staff operate both a summer school and a nonacademic out-of-school-time program. Programs for all 10 DC 21st CCLC schools were in operation from June 25 to August 3, 2001, at 8 of the 10 schools where DC 21st CCLC operates during the school year. Students from the remaining two schools were allowed to attend at one of the sites that was open.

The morning academic program used two computer software programs: ReadProg[8] and MathProg. All eight sites had both ReadProg and MathProg courses in place. Each site had at least one class that used each type of software; some had multiple classes. ReadProg and MathProg complement other, more traditional (noncomputer) courses and most children attended both the computer-oriented and more traditional classes. The frequency of ReadProg and MathProg classes varied from every day to twice a week. ReadProg sessions ranged from 45 minutes to 1½ hours, with the typical class being about an hour long. MathProg sessions tended to be a little longer, from a minimum of one hour to a maximum of five hours. The average MathProg session lasted about 1½ hours. The students who participated in these activities were in the 6th through 10th grades.

Students gave many different reasons for attending the summer school program, predominantly mentioning poor academic performance (either low grades or low SAT-9 scores), parental requests, and having "nothing better to do." These reasons seemed to explain why students were in the ReadProg program, which is mainly for remedial purposes. The MathProg program is an enrichment program, so students were required to meet testing guidelines before they could be admitted. Ongoing participation in both programs was contingent on good behavior, attendance, and appropriate performance.

In a typical session, students came in from their previous class and sat at one of the computers. The facilitator might give a brief introduction, but usually the students simply logged into their accounts and started working. The entire session was spent doing exercises, reading lessons, taking tests, and pursuing other activities dictated by the software. The students worked independently, speaking occasionally with the facilitator when a question arose. At the end of the session, the students logged out of their accounts and headed off to their next activity for the morning.

The quality of adult supervision was quite impressive. Classes tended to be very reasonably sized. The size of the ReadProg classes varied widely, from 3 to 20 students. The average number of students was about 14. The MathProg classes were somewhat smaller, averaging

around 8 students, although the range was from 3 to 18. Many of the larger classes also had aides or classroom teachers, so the average student-to-facilitator ratio was around six to one.

The quality and quantity of equipment and facilities were excellent. Each activity took place in a classroom that was clean, well-lit, and spacious. Most sites had air-conditioning, although three did not, and heat was a problem in at least one of these. In every observed activity, each child had access to his or her own computer.

On the whole, facilitators were very pleased with both ReadProg and MathProg. MathProg facilitators enjoyed the immediate feedback of the program, ease of checking progress, self-explanatory nature, extensive practice, good homework, and the fact that it requires a low level of supervision. ReadProg facilitators liked the ease of use, immediate feedback, options for checking progress and adjusting skill levels, pre- and posttests, and the fact that the program motivates and interests students.

In general, students exhibited commendable behavior. Facilitators kept the rooms quiet and orderly through active supervision. Most students exhibited a high level of engagement in both ReadProg and MathProg sessions. Students were actively engaged throughout the sessions: working diligently on the matching exercises in ReadProg or reading notes and solving homework problems in MathProg.

Although the overall level of engagement was high, the level of interest and enjoyment of the activities was less impressive for some students. While students using ReadProg seemed to be generally engaged—in the sense that they were actively working—they did not seem to be especially attracted to the program. Many of the students in one focus group complained that ReadProg takes too long, because the activities have to be repeated until students can perform them with a consistent speed and accuracy. A boy in this group said that he did one activity 25 times. Two of the facilitators agreed that the repetition made it hard for the students to stay motivated. One facilitator further elaborated that this issue, as well as the excessive number of exercises, were program flaws. There was some dissatisfaction with MathProg as well. Some students wished the program had been more challenging and exciting.

There was little evidence that most students were either excited about or motivated by their progress.

One might also hope that enrollment in these programs would increase as students become aware of the technology options. Unfortunately, the enrollment and attendance numbers suggest that many Washington, D.C., youth are not taking advantage of the opportunities available through the DC 21st CCLC program. For instance, as Table 3 shows, less than a quarter of the students enrolled during the school year in these schools attended the summer program in 2001 (The range is 13 percent to 41 percent.). Indeed, the total number attending (920) was lower than the number for the summer of 2000, when almost 1,000 students attended.

A major benefit of using these software packages, and one that many facilitators mentioned, was that they could customize the program for each student. However, for both ReadProg and MathProg, everyone seemed to begin at the first level, even though students spanned a four-year grade range and in spite of the fact that pretests were given to all the ReadProg students.

exams of students whose instructors used laptops in the classroom was 86.8 percent, while the average score on exams of students whose instructors who did not use laptops in the classroom was 83.5 percent. This difference was statistically significant ($p < .05$).

We assessed students' attitudes through end-of-course surveys, categorizing the 42 questions into one of the three dimensions examined in this study: student motivation and interest, instructor efficiency, and student learning. Nine of the 15 questions related to student motivation and interest (60%) were rated significantly more favorable ($p < .05$) in the technology sections. A similar trend in favor of the technology sections was also evident in 3 of the 5 questions related to teaching efficiency.

URL

For complete report findings: http://www.educause.edu/ir/library/pdf/EQM0431.pdf

Keywords:

Student achievement, student attitudes

Study
Web Browsing, Mobile Computing and Academic Performance

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Description/Research Question(s)/Major Finding(s)
As the result of a gift by a generous corporate sponsor (Intel Corporation), we had the opportunity to supply laptop computers to students in two university courses (a Communication course and a Computer Science course) for use over a full semester and to study their use of these computers. The computers included wireless network cards that gave these students wireless access to the campus network from a number of strategic locations on campus: 1) in and around the two classrooms, 2) in and around the major campus libraries, 3) in and around a major campus cafeteria, 4) outdoors, near/between these locations. When students used their laptops to browse the Web, browsing (URL, time, date, etc.) was captured by a proxy server and recorded in an extensive log file. The laptop computers were distributed to the students during the second week of classes; they were returned during the last week of classes.

In this study, we correlated the amount (e.g., number of times, number of minutes) a laptop computer was used by a student for Web browsing with the student's academic performance. To our knowledge, this is the first time a continuous measure of usage (instead of a discrete measure, like laptop user versus non-laptop user) has been correlated with performance in a classroom laptop study. Our intention was to evaluate some of the findings observed in previous studies—especially those regarding improved academic performance and extension of the school day. This study, then, is one of very few to correlate characteristics of a student's actual behavior related to using a laptop computer inside and outside of the classroom with their resulting individual academic performance.

Research questions:

1. Is there evidence indicating academic performances are enhanced by students taking advantage of nearly 'ubiquitous' access to mobile, networked computers?

   Statistically significant positive correlations between independent variables indicating "quantity" of browsing and final course grade will tend to support enhancement of academic performance as result of ubiquitous computing.

2. Is there evidence indicating students' academic performances are enhanced by having access to the laptop computers outside of the classroom—thereby "extending the school day"?

   Statistically significant positive correlations between independent variables indicating "quantity" of browsing and final course grade—for browsing recorded between classes and/or from home—will tend to support the "extension of the school day" claim.

3. Are there mediating factors affecting the valences of questions 1 and 2 that can be isolated?

   Statistically significant correlations within one browsing context but not another, for students in one course but not the other, or for one gender group but not the other, will tend to implicate browsing context, gender and/or course (respectively) as significant factors mediating correlations between Web browsing and academic performance.

Across both courses, the longer the average browsing sessions students engaged in during class the lower the final grades they tended to receive (coeff=-0.284, p=.029). This suggests that longer browsing sessions during class tend to be a liability for students' academic performances regardless of the nature of the students or the course.

For the study described in this paper, we purposely avoided examining the content of the URLs students were browsing. This was both to keep the study manageable and to see if something insightful could be gleaned from observing behavioral browsing characteristics alone. Although we believe this to have been a fruitful direction, we would not reject the possibility that integrating an investigation of the content of the URLs with these data may provide even more insight.

URL
For complete report findings: http://ifets.ieee.org/periodical/vol_3_2001/grace_martin.pdf

Keywords:
Student achievement

Study
West Virginia Story: Achievement Gains from a Statewide Comprehensive Instructional Technology Program 1999; What impact does technology have on learning?

Author (s)
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Description/Research Question(s)/Major Finding(s)

In 1990, the state of West Virginia implemented its Basic Skills/Computer Education program. This study – a collaborative investigation by the West Virginia Department of Education, the Milken Exchange on Education Technology, and Interactive Incorporated – found that the program has had a measurable positive impact on learning. West Virginia has seen across-the-board increases in statewide assessment scores in all basic skill areas, and students' NAEP (National Assessment of Educational Progress) scores have risen. The study also attributes eleven percent of West Virginia's increase in mathematics and language arts scores to the computer interventions.

This 51-page report released in 1999 is a collaboration of the West Virginia Department of Education and the Milken Exchange on Education Technology.

The study marks the first time that a long-term statewide learning technology program has been assessed for its effectiveness. The researchers examined West Virginia's Basic Skills/Computer Education (BS/CE) program, whose objective was to use the computer as a tool for improving the basic skills and to provide comprehensive teacher training on utilizing computers in the classroom. The program's ten-year history makes it the nation's longest-running state program for the implementation of technology in education.

A significant aspect of the study was that the educational gains achieved by West Virginia's learning technology program proved to be cost-effective. In fact, an analysis of effect sizes conducted by Dr. Lew Solmon, senior vice president and senior scholar of the Milken Family Foundation, revealed that the implementation of learning technology was significantly more efficient than other popular interventions such as class size reduction.

West Virginia's technology program also increased socio-economic and gender equity. The Milken Exchange study found the state's BS/CE program to be highly successful in equalizing opportunity for low-income and rural students, and revealed that the greatest improvement in total basic skills was achieved by children **without** computers at home.

West Virginia's program was also found to be effective in providing girls — widely reported to be at a disadvantage in learning technology programs — with equal access to computers; as a result, computer use was equal among boys and girls.

The study identifies several reasons West Virginia's program is effective:

- Rather than isolating computer skills from academic learning, West Virginia's BS/CE program integrated technology into the instructional program. In other words, the technology was a means of learning the basics, not an end in itself.
- The report revealed that the computers inside classrooms were more effective than centralized computer labs in producing basic skill gains in students and in promoting the confidence and technological competence of teachers.
- The report also revealed the importance of timely and comprehensive teacher training as a key factor in the success of West Virginia's technology program.

URL

For complete report findings: Download study from
http://www.mff.org/publications/publications.taf?page=156

Keywords:

Student achievement, gender, low income, teacher training